SCIENTIFIC AMERICAN

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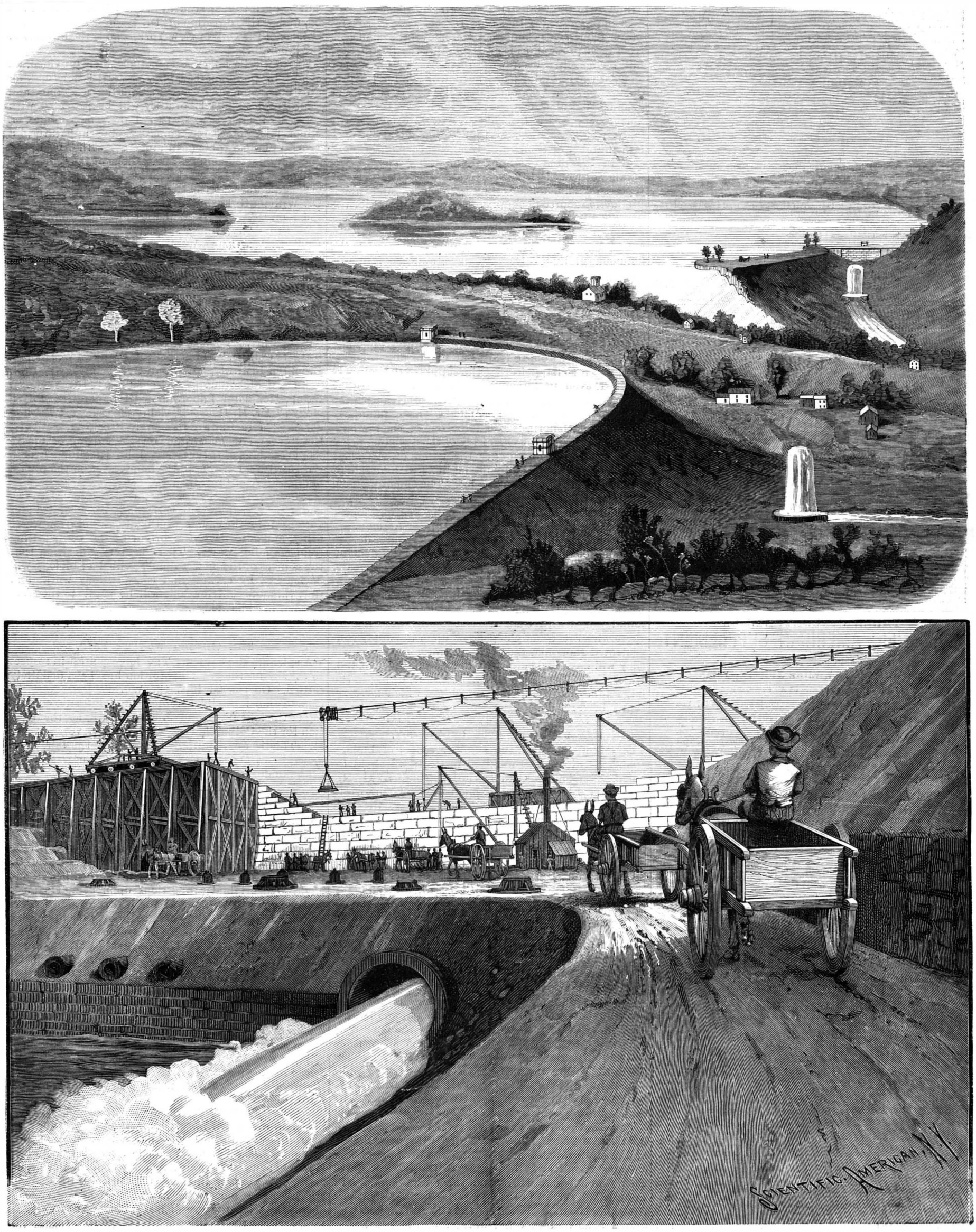
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXIII.—No. 2. ESTABLISHED 1845. NEW YORK, JULY 12, 1890. $3.00 A YEAR. WEEKLY.



THE NEW CROTON AQUEDUCT. NEW YORK—THE SODOM AND BOG BROOK RESERVOIRS.—[See page 21.]

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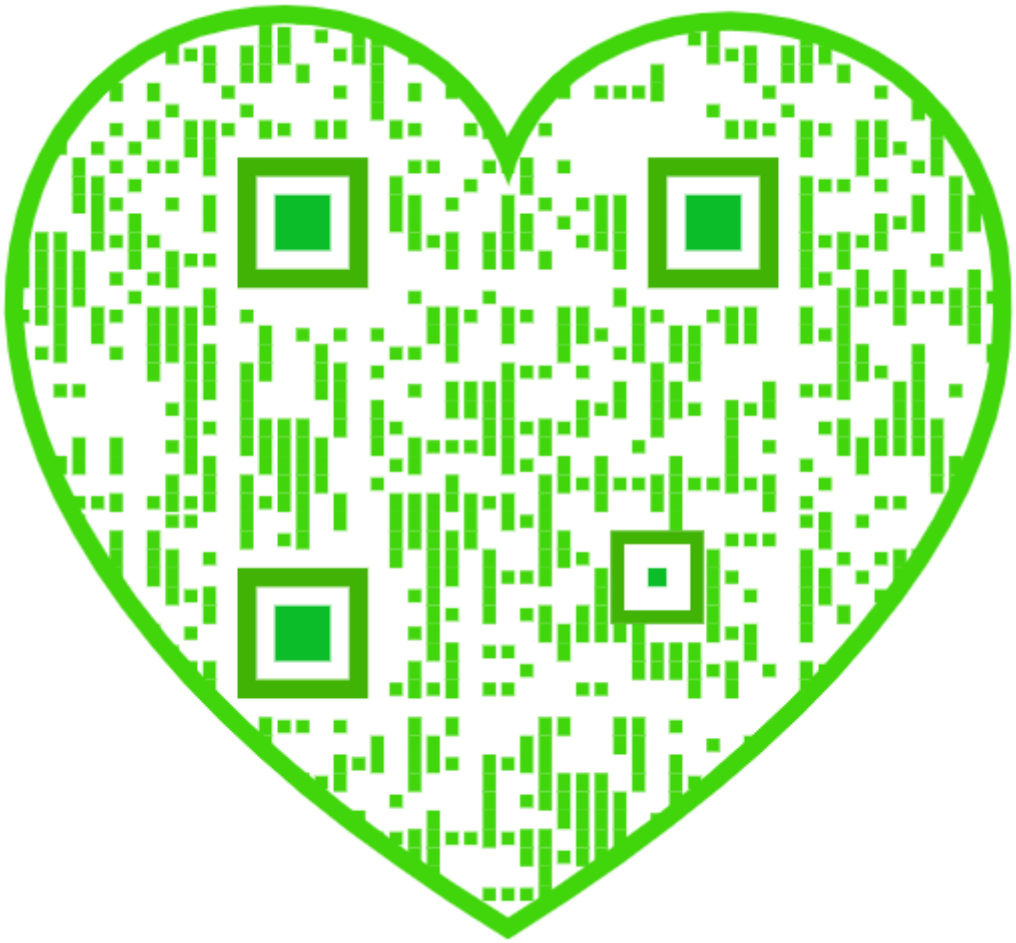

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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NEW YORK, SATURDAY, JULY 12, 1890.

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AMMONIA.

The wholesale price of concentrated liquid ammonia has recently advanced from 5¼ cents a pound to 9 cents, and at this writing it is extremely difficult to get enough to supply the demand even at that price. The immediate cause of this great advance in price is due to the unexpectedly large orders from the manufacturers of artificial ice which have been received during the last few weeks.

The ammonia which is used in ice making is obtained from what is known as gas liquor, and is produced in the process of carbonization of coal in gas manufacturing. At this season of the year only about 40 per cent of the amount of gas liquor is to be had which is available in the winter season, owing to the decreased consumption of gas in summer. The laws of several States require gas companies to remove the ammonia from their product, as it greatly improves its quality, but it has only been within recent years that the element thus obtained has been utilized for the production of refined ammonia, which is now in such great demand that manufacturers find themselves totally unable to supply it. Still another cause exists for the scarcity of ammonia, and that is the changing of a large number of companies from the carbonization of coal in the production of illuminating gas to the making of what is known as water gas. In the latter process no ammoniacal liquor is produced, and thus a productive source of supply of the raw material for the manufacture of concentrated ammonia has been entirely cut off.

Very ingenious machinery is used in extracting the ammoniacal liquor from the gas, and the former is then disposed of to chemical companies, who subject it to a special course of treatment to prepare it for general use.

Sulphate of ammonia is produced by the carbonization of bone and animal matter, but this product is generally employed as a fertilizer. Aqua ammonia has been made from the salt, but not to any great extent, and it so happens that the supply of the sulphate is short, even in foreign lands, where manufacturers have vainly attempted to supply themselves with the much coveted article. Ammonia, also familiarly known as hartshorn, is said to be one of the few substances known to the chemistry of the ancients, being referred to by Pliny under the name of vehement odor, which he evolved by mixing lime with nitrum or what was probably sal ammoniac. The name ammonia was given in ancient times because of the fact that sal ammoniac was originally obtained by heating camel's dung in Libya near the temple of Jupiter Ammon.

Ice manufacturers say that some other source of supply must be found for crude ammonia, as the demand from the producers of artificial ice will greatly increase. It is said that ammonia can be obtained in large quantities from shale, which is a kind of slate found in Pennsylvania, specimens of which are sometimes found mixed with coal. It is claimed, however, by those who are usually depended upon to supply concentrated ammonia, that with a winter supply of gas they will have little difficulty in meeting the demand, which is wholly phenomenal at this time, owing to the large number of ice-making machines which have recently been set up.

A SUMMER SCHOOL OF BIOLOGY.

On Monday, July 7, the summer school of biology connected with the Brooklyn Institute will hold its opening session at Cold Spring Harbor, L. I. Mr. Eugene G. Blackford, president of the New York State Fish Commission, and Mr. Fred. Mather, the well known fish culturist, have co-operated with the gentlemen of the Brooklyn Institute in organizing this school for biological research, which is about to be inaugurated under most favorable auspices.

Cold Spring Harbor is on the north shore of Long Island, thirty-two miles from New York, and has many features which are specially favorable for the student in natural history. The building which will be used as a laboratory is located at the head of the harbor or bay, which is particularly rich in marine life. In the immediate vicinity of the laboratory are a series of ponds, which are fed by inexhaustible springs, which also abound in forms of fresh water life.

The surrounding country is high and rolling, having abundant forest glens and small streams, which abound in attractive subjects for the student. The laboratory will be abundantly supplied with fresh water from springs in the immediate vicinity, which are used during the hatching season by the commissioners in propagating fish, and salt water will be obtained from the harbor near by, from which it will be pumped into a tank or reservoir.

There have been provided several row boats, a sail boat, and a steam launch, together with nets, hooks, and dredges for use in collecting and dredging. The steamer Fish Hawk, belonging to the United States Fish Commission, will spend the entire summer in Long Island Sound pursuing a series of investigations regarding the depredations of the star fish among the oyster beds and in other work, and the gentlemen composing the school of biology are to make several extended excursions on this vessel, when they will have the benefit of the dredging and other operations.

The following announcement is made regarding the course of study: "Students who pursue the general course of instruction during the summer and who have time for extra work will be given the facilities necessary to enable them to carry on courses of special investigation; while those students who have already gained the knowledge and experience which is provided by the general course will be permitted to give their entire time to special work. No special courses will be laid down in advance, but each student will be at liberty to arrange with the director of the laboratory for such a course as may be practicable. A general course will be open to each student at the laboratory, and will be under the direction of Dr. Bashford, Dean of the College of the City of New York, who is the director of the laboratory."

There will be an expert photographer provided, an expert in photomicrography, an artist for making drawings, and an expert in coloring drawings and photographs. The laboratory will be provided with compound microscopes, two Baker microtomes, a Minot microtome, photomicrographic apparatus, a general photographic outfit, together with other appliances and instruments. The sessions of the school will continue for eight weeks. The lecturers who have been announced, with their subjects, are as follows: Dr. William G. Farlow, Harvard University, who will speak on "Algæ;" Dr. William K. Brooks, Johns Hopkins University, whose subject will be "Molluska;" Prof. H. W. Conn, Wesleyan University, "Bacteriology;" Prof. William Stratford, College of City of New York, "Photomicrograph;" Col. Nicholas Pike, Brooklyn Institute, "Herpetology;" Dr. Nathaniel L. Britton, Columbia College, "Systematic Botany;" Prof. John B. Smith, Brooklyn Institute, "Coleoptera;" Dr. Bashford, Dean College City of New York, "Comparative Zoology;" Dr. Byron D. Halstead, Rutgers College, "Fungi;" Prof. Franklin W. Hooper, Brooklyn Institute, "Comparative Osteology;" Prof. John Mickleborough, "Crustacea;" Dr. Geo. T. Kemp, Hoagland Laboratory, "Comparative Physiology;" Dr. H. Hensoldt, Columbia College, "Echinoderms;" Mr. Ludwig Riederer, Brooklyn Institute, lecturer and demonstrator on the cutting of microscopic sections of tissues; Mr. John Ketchum, Brooklyn Institute, lecturer and demonstrator on the photomicrography of fresh tissues.

Professor Albert R. Leeds, of the Stevens Institute, and four assistants will carry on a series of investigations into the causes of the diseases of fresh water fishes, and also as to the origin of the odors arising from standing water. There is every indication that the courses of the new summer school of biology will be marked by earnest and conscientious work, and that valuable contributions will be made to the store of scientific knowledge.

THE CHICAGO WORLD'S FAIR.

A splendid site chosen. The long contest in respect to the site for the great exhibition has been definitely settled. On the 2d inst. the World's Fair National Commission formally accepted the joint site, consisting of the lake front and Jackson Park, as the location for the Columbian exposition, by a vote of 78 to 11. This is an admirable location for the fair, gives general satisfaction, and assures the success of the grand undertaking.

Raised Figures on Soft Wood.

Ordinary moulding and stamped work and the papier mache and pressed sawdust embossed work have been on the market for a long time, and but few people mistake them now for hand work. Basswood can be compressed to a very large extent, and will swell out again to its original proportions upon being steamed. This property is utilized in the following manner. A piece of the wood is subjected to great pressure under a die or stamp. This stamp presses down parts of the soft wood, in a more or less elaborate pattern, lower than the rest of the surface. This process can be quickly performed, and the piece of wood is then passed to a planing machine, which in a twinkling planes down the surface of the wood just even with the top of the compressed pattern. The piece is then taken over to the steamer, where the warm, damp vapor soon swells the compressed parts back to their original size. Thus a handsome raised pattern is produced on the planed surface of the wood, which can hardly be distinguished from genuine hand-carved work.

A NEW method of obtaining stained glass is done by a process of printing. The design is embossed on an iron plate, on which a lump of hot glass is rolled until it takes the form of the plate on which the pattern is cast. The sunken lines are then filled with enamel and the whole plate is fired. This process obviously does away with the use of leads, is rapid in its execution, and has the additional advantage that the design may be repeated as often as it may be required.

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A Large Girder.

The Keystone Bridge Co. has just completed a girder for the new City Hall of San Francisco which is the largest ever made in the United States, so far as the members of the firm know. It is 105 feet long, and weighs 70 tons. A contract for two girders was given to the company last November, and they have been working on it ever since. The materials for the second one are now being prepared. The girders are intended for the ground floor of the building.

The great problem now is to transport it to the Pacific coast. The Chicago & Northwestern and Union Pacific roads have undertaken the job. The long monster recently was lying on three of the largest freight cars obtainable on the Allegheny tracks. Mr. E. H. Utley, the freight agent for Carnegie, Phipps & Co., stated that it was necessary to put in additional trusses to distribute the weight evenly on the three cars. As the cars are constructed, the weight of the girder fell on the centers, and the cars would hardly stand the strain. Mr. Utley thinks that the way it is placed in the cars will allow it to go around the curves all right. The usual plan for shipping girders is to carry them in pieces and have the plates riveted together at the place of destination. The company was afraid they didn't have the facilities on the Pacific coast to do the riveting The second one will not be built until they see whether or not it can be transported. The average car in the West will carry about 15 tons, and Mr. Utley says that should anything happen to either of the three cars the road would have some trouble to replace them. —*Pittsburg Dispatch.*

Why Thunder Storms Affect Milk.

During electrical disturbances it seems that cream and milk are put into a condition to sour easily. The probable cause of this, the editor of the *Cultivator* (Albany) explains as follows: The effect of an electrical discharge is to decompose a portion of the atmosphere, by which ozone is produced. This substance has peculiar properties from its intense activity as an oxide of oxygen, and its action is often believed to be, and may be, the cause of the souring of milk, beer, and fresh wine during what are known as thunder storms. The ozone is diffused through the air, and is believed to be the cause of the strong acid odor which prevails after the storm is passed. No doubt if the milk is submerged in water, and access of air is prevented, no result of the kind need be apprehended; and as the more milk is exposed to the air the more it will be affected by the ozone, the milk in open shallow pans will be acidified more readily than that in deep pails, although these may be open. In our long experience, however, the writer adds, we have never had any milk affected in this way, either in shallow pans or deep pails, and are of opinion that the heat of the air preceding thunder storms is more directly the agent in the souring of the milk than the ozone that may exist in the air after the storm is passed. Carefulness to maintain a proper temperature, by closing dairy houses and cellars against the outer atmosphere, will be a means of safety.

The Inhabitants of Cheese.

Mr. Adametz has just made some microscopic researches upon the microscopic organisms that inhabit cheese. From an examination of Emmenthal, a soft variety of Gruyere cheese, he has obtained the following results: In each gramme of the cheese, when fresh, from 90,000 to 140,000 microbes are found. This number increases with time. Thus, a cheese 71 days old contains 800,000 bacteria per gramme. The population of a soft cheese 25 days old and much denser than the preceding is 1,200,000, and that of a cheese 45 days old is 2,000,000 microbes per gramme. But the population of a cheese is not everywhere distributed the same in it. The center is but moderately inhabited with respect to the exterior portion. The population of a soft cheese, near the periphery, is from 3,600,000 to 5,600,000 microbes. According to the mean of these two figures, there are as many living organisms in 360 grammes of such a cheese as there are people upon the earth.—*La Nature.*

A Waterproof Whitewash.

Resenschek, of Munich, mixes together the powder from three parts of silicious rock (quartz), three parts of broken marble and sandstone, also two parts of burned porcelain clay, with two parts of freshly slaked lime, still warm. In this way a wash is made which forms a silicate if often wetted, and becomes, after a time, almost like stone. The four constituents, mixed together, give the ground color, to which any pigment that can be used with lime is added. It is applied quite thickly to the wall or other surface, let dry one day, and the next day frequently covered with water, which makes it waterproof. This wash can be cleansed with water without losing any of its color; on the contrary, each time it gets harder, so that it can even be brushed, while its porosity makes it look soft. The wash, or calcimine, can be used for ordinary purposes, as well as for the finest painting. A so-called fresco surface can be prepared with it in the dry way.

TRADE MARK DECISIONS.

U. S. Circuit Court—Northern District of Illinois.

SINGER MANUFACTURING COMPANY *vs.* JUNE MANUFACTURING COMPANY.

Blodgett, J.

That the patentee, Singer, and his successors, have manufactured sewing machines publicly known as "Singer Sewing Machines," and the name "Singer" has come to identify the special kinds of machines made by them, does not, after the expiration of the patent, give them the exclusive right to the use of the term "Singer" as applied to sewing machines.

After the expiration of the patent the public may manufacture machines having the same form of construction, and even ornamentation, used by the patentee.

A trade mark consisting of an oval plate attached to the machine, stamped in the center with a shuttle and two crossed needles, whose threads form an "S," and around the edge with the words "Singer Sewing Machine Co.," and a wreath of leaves, is not, in the absence of a right to the plate itself as a trade mark, infringed by a similar plate with the words "Improved Singer" in the border and the monogram "J. M. Co." in the center.

A manufacturer has the right to buy old machines of another make, and to repair, repaint, and sell them again without removing the trade mark put on them by their manufacturer.

The Nitrifying Process and Its Specific Ferment.*

The process of nitrification has been practically studied for centuries, but it was first in the year 1878 that it was shown by Schloesing and Muntz to be dependent upon the presence of certain minute forms of life, or micro-organisms, or, in other words, to be a fermentation change.

The authors have been engaged during the last three years in endeavoring to isolate the nitrifying organism, and the present memoir gives in detail an account of the numerous experiments which were made in this direction.

Nitrification, having been in the first instance induced in a particular ammoniacal solution by means of a small quantity of garden soil, was carried on through twenty-four generations, a minute quantity on the point of a sterilized needle being introduced from one nitrifying solution to the other. From several of these generations gelatin plates were poured, and the resulting colonies inoculated into identical ammoniacal solutions, to see if nitrification would ensue; but although these experiments were repeated many times, on no occasion were they successful.

It appeared, therefore, that the nitrifying organism either refused to grow in gelatin or that the authors had failed to find it, or that, growing in gelatin, it refused to nitrify after being passed through this medium.

Experiments were, therefore, commenced to endeavor to isolate the organism by the dilution method. For this purpose a number of series of dilutions were made by the addition, to sterilized distilled water, of a very small quantity of an ammoniacal solution which had nitrified. It was hoped that the attenuation would be so perfect that ultimately the nitrifying organism alone would be introduced.

After a very large number of experiments had been made in this direction, the authors at length succeeded in obtaining an attenuation consisting of about $\frac{1}{1000000}$ of the original nitrifying solution employed, which not only nitrified, but on inoculation into gelatin peptone refused to grow, and was seen under the microscope to consist of numerous characteristic bacilli hardly longer than broad, which may be described as bacillo-cocci.

These results are the more striking, for, in the case of the two other bottles similarly diluted, one had not nitrified, but, on inoculation into gelatin peptone, produced a growth already on the second day, while the remaining bottle not only produced a growth, but had also nitrified, thus clearly showing that the number of organisms had been reduced to two, *i. e.*, one which nitrified and did not grow in gelatin and another which had nothing to do with nitrification, but which grew in gelatin. In the case where nitrification took place and a growth also appeared in the gelatin tube, it was obvious that both the nitrifying and non-nitrifying organisms were present. These inoculation tests, together with the microscopical appearances, were confirmed by repeated experiments, with invariably the same results.

It is, however, very remarkable that, although this bacillo-coccus obstinately refuses to grow in gelatin when inoculated from these dilute media, yet in broth it produces a very characteristic growth, which although slow in commencing, often requiring three weeks before it makes its appearance, is very luxuriant.

The authors have, moreover, been successful in inducing nitrification in ammoniacal solutions inoculated from such broth cultivations, the extent of which has been quantitatively determined.

Although microscopically its form differs slightly when grown in broth and the ammoniacal solution respectively, yet its identity was established beyond question by its returning to its characteristic bacillo-coccus form when grown again in the ammoniacal solution.

The authors have also been able to induce its tardy growth in gelatin peptone by passing it first through broth cultivations.

The paper is accompanied by carefully executed drawings of the nitrifying organism when grown in the various media employed.

* Abstract of a paper read before the Royal Society, March 13, 1890. By Percy F. Frankland, Ph.D., B.Sc. (Lond.), A.R.S.M., etc., Professor of Chemistry in University College, Dundee, and Grace C. Frankland.

Relative Costs of Transmission of Power.

The following comparisons of cost of transmission of power by various methods appeared in the *Revue Universelle des Mines:*

1. Comparative cost on 10 horse power transmitted 1,093 yards: By cables, 1·77 per effective horse power per hour; by electricity, 2·21; by hydraulics, 2·90; by compressed air, 2·98.

2. Comparative cost on 50 horse power transmitted 1,093 yards: By cables, 1·35 per effective horse power per hour; by hydraulics, 1·87; by electricity, 2·07; by compressed air, 2·29.

3. Comparative cost on 10 effective horse power transmitted 5,465 yards: By electricity, 2·64 per effective horse power per hour; by compressed air, 4·66; by cables, 4·69; by hydraulics, 5·29.

4. Comparative cost on 50 effective horse power transmitted 5,465 yards: By electricity, 2·37 per effective horse power per hour; by cables, 2·65; by compressed air, 2·99; by hydraulics, 3·02.

Steam was the prime mover used in each of the above instances, and it appears that for long distances electricity takes the lead in economy over all other systems. It has also a great advantage in the facility with which the power may be subdivided, and there appears to be no doubt that, in future coal mining, electricity will be much used for coal cutting, tunneling, hauling, pumping, etc., as well as for lighting.

Elevator Sickness.

The elevator in modern big buildings has only one drawback—the sickness it causes when the car is suddenly stopped. To people of a delicate constitution this sickness is often such a serious matter that to them the elevator is a dangerous blessing. This sickness, says a contemporary, can be avoided by observing simple physical laws. Elevator sickness is caused by the same law that throws a person to the ground when he gets off a moving car in the wrong way. The stoppage of the elevator car brings a dizziness to the head and sometimes a nausea at the stomach. The internal organs seem to want to rise into the throat. All this comes from the fact that all parts of the body are not stopped at the same moment of time. The feet being next to the car floor stop with the car, while other portions of the body continue moving. If the body as a whole can be arrested at the same time with the feet, there will be no sickness. This can be done by placing the head and shoulders against the car frame. Then there will be no sickness, and, according to the *Scientific Press*, it is a sure preventive.

A Powerful Objective.

Dr. Van Heurck announces in the *Journal de Micrographie* that Zeiss, working from the formulæ of Professor Abbe, has succeeded in producing a 0·1 inch "apochromatic" objective with an aperture of 1·63, and so constructed that under suitable conditions the whole of this aperture can be utilized. The author states that with this objective he has resolved the entire frustule of *Amphipleura pellucida*, not merely into lines, but into pearls as distinct as he has ever seen on *Pleurosigma angulatum*. Repeated measurements show these pearls to be arranged in lines separated longitudinally by $\frac{1}{50000}$ part of a millimeter, while the transverse striations are separated by the $\frac{1}{80000}$ of a millimeter (about 0·00001 and 0·000014 inch respectively). Three of the new glasses have been made at a cost of $2,000 each.—*Microscopical Journal.*

Manufacture of Filtering Material.

The process consists essentially in reducing ferric oxide by heating it in contact with gaseous fuel. Small pieces of iron ore, preferably hematite, are packed into a retort heated externally, preferably by producer gas. When the charge is at a cherry red heat, gaseous fuel is admitted into the retort and brought into thorough contact with the ore. At the end of four or five hours, if the exit gas be inflammable, the process is finished and the charge raked out and allowed to cool. Ordinary coal gas or other gaseous fuel may be used instead of producer gas. The retorts may be oscillated, rocked, raked, etc., by machinery. The magnetic oxide so produced is available for filtering water, sewage, sugar sirups, alcoholic liquors, etc.

17,550,216 was the population of old Spain in 1887—the last census, now made known. It shows increase at the rate of half of one per cent per year.

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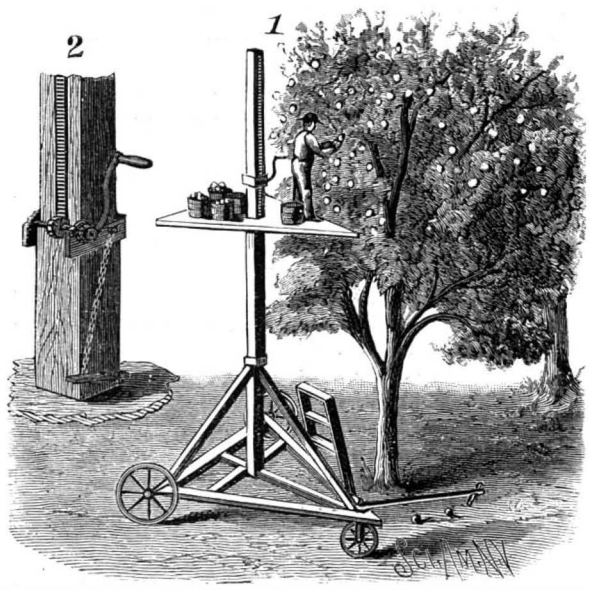
AN IMPROVED FRUIT PICKING STAND.

This device, patented by Mr. Jesse C. Greenlow, of Pepperwood, Cal., is preferably made with a triangular base to allow it to be supported on three wheels and more readily moved in and out among the trees. The

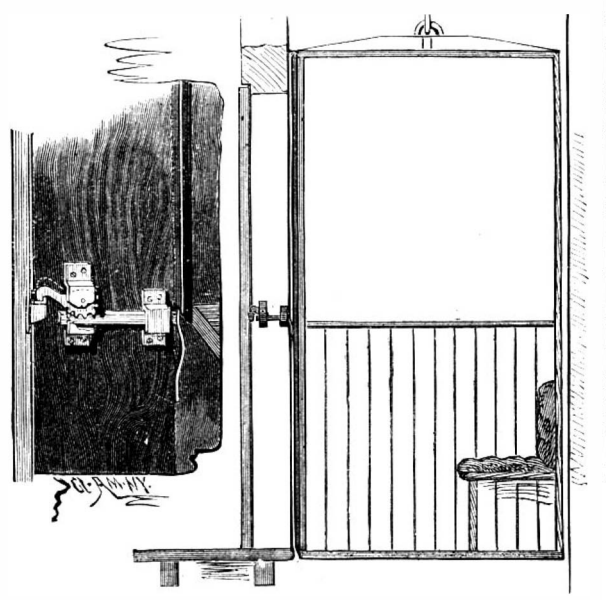


GREENLOW'S FRUIT PICKING STAND.

middle beam of the base frame is adapted to be engaged by the forked lower end of a vertical post, held in place by braces from the corners bearing under an offset on the post, the braces being removable to permit of conveniently taking down and setting up the post. A triangular platform is held to slide vertically on the post, the platform having an upwardly extending sleeve which fits the post, and has bearings for a shaft carrying a gear wheel meshing in a rack on one side of the post, as shown in Fig. 2. This shaft has a crank arm by which it is operated by one standing on the platform, and a ratchet wheel on the shaft is adapted to be engaged by a pawl fulcrumed on the sleeve and connected by a chain with a treadle. On one side of the base is a short ladder, to facilitate reaching the platform when it is in its lowest position, the operator then raising the platform by means of the crank arm and its connected gear and rack. The pawl and ratchet hold the platform in position when the desired height has been reached, the pawl being disengaged by pressing on the treadle when it is desired to change the position of the platform or lower it to the offset. The several parts can be readily disconnected for convenience of transportation or storage.

AN IMPROVED SAFETY LATCH FOR ELEVATOR DOORS.

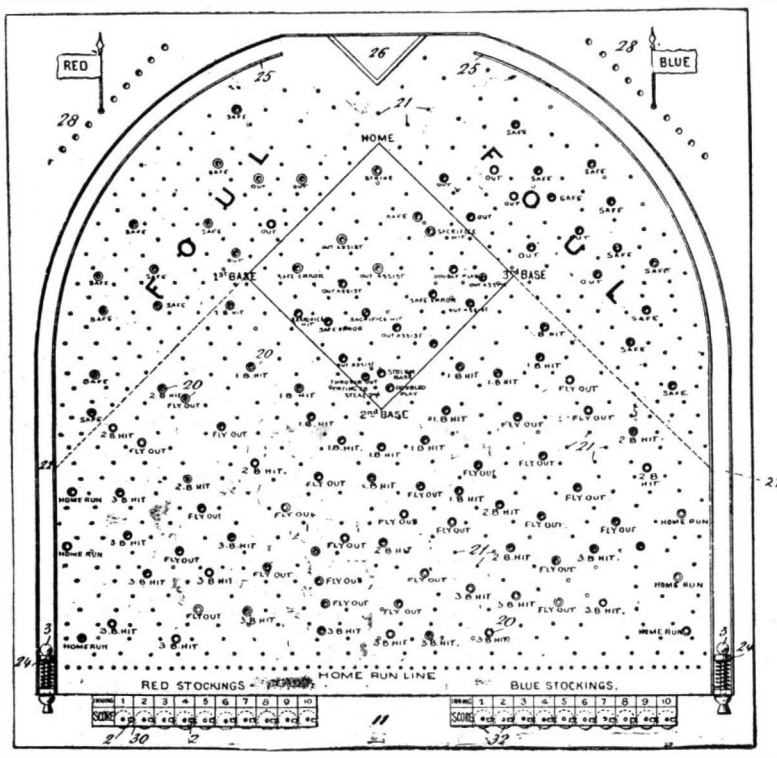
The illustration shows a device whereby an elevator car, in ascending or descending, upon reaching a floor, will automatically unbolt the shaft door, and when it leaves the floor, if the door is closed, it will be automatically locked. It is a patented invention of Mr. John Johnston, of No. 316 East Fifty-ninth Street, New York City. The door of the shaft is provided with a keeper, and on the inner face of the door jamb is a strap within which the inner end of a latch is eccentrically pivoted, this latch having a head adapted to engage with the keeper of the door, as shown in the small view, while its inner or pivotal end is somewhat circular, and has below the fulcrum, on its inner side, a series of teeth. These teeth are adapted to mesh with teeth in the upper edge of a sliding rack bar, against the inner extremity of which bears a bowed spring, secured at its lower end to the inner edge of the jamb. The elevator car has a bar attached to its front at one side, and extending from top to bottom of the car, the ends of the bar being beveled, and the bar extending a sufficient distance from the face of the car to contact with the bow portion of the spring and compress it when the car is passing a floor. When the car is out of contact with the spring, the latch drops by gravity into engagement with the door keeper, forcing the rack bar outward; but when the bar at the side of the car, as the latter ascends or descends, contacts with the spring, the latter is compressed to move the rack bar and raise the latch.



JOHNSTON'S SAFETY LATCH FOR ELEVATOR DOORS.

AN IMITATION BASEBALL GAME.

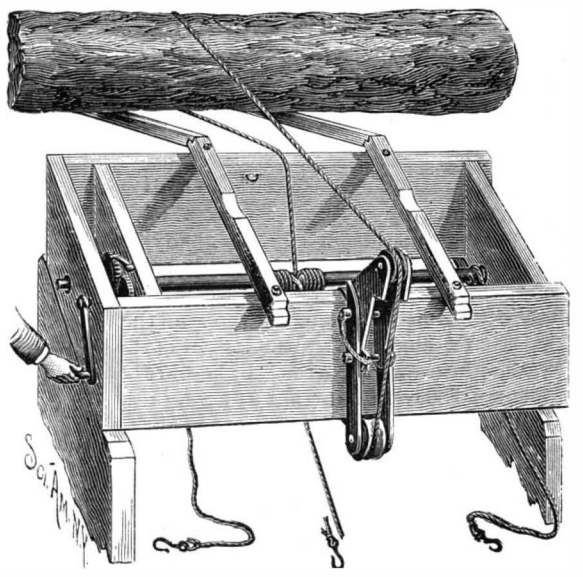
The illustration shows a plan view of a game board laid out to represent a baseball field, with depressions in every portion marked to represent the average character of "the play" which would be made with a ball struck to reach any one of the depressions, and means whereby chance shots can be made with a marble to attain similar results. It is a patented invention of Mr. John W. Maxcy, of Austin, Texas. The game board is so hinged upon a base plate that it may be set at a slight adjusted inclination toward the player, and at each side of the field is a way or gutter, in the lower end of which is a spring-pressed plunger. The depressions or recesses in the board are of sufficient depth to retain a ball or marble employed in playing the game, and in addition to the recesses, a number of baffle pins are arranged indiscriminately upon the board. The side ways or gutters do not extend entirely across the upper end of the board, but lead to an angular rubber-faced block, 26, which serves as a back stop, which throws the ball back upon the field at different angles, and to various points, according to the manner in which the ball is propelled against it by the plungers. Outside of the field proper, above the curves of the ways or gutters, are apertures to receive flags representing the players of the games, and below the board are arranged counters with numbered disks, whereby the count of a game may be kept by innings for ten innings. The farther down the ball travels the greater is the credit, as will be seen from the naming of the several recesses.



MAXCY'S BASEBALL GAME.

AN IMPROVED LOG LOADING MACHINE.

The illustration represents a device by which logs may be quickly, easily, and safely loaded upon a vehicle, or rolled to the saw in a mill yard. It has been patented by Messrs. Joseph W. Kuntz and Charles A. Eschenbrener, of Republic, Ohio. A rectangular frame is mounted upon suitable supports of a vehicle, the frame having cross pieces upon which the logs may rest, and a longitudinal shaft is journaled in the frame, having a gear wheel near one end meshing with a gear wheel on a short shaft, to which is attached a crank arm. Attached to the longitudinal shaft are binding ropes or chains for securing the log in position, and near its center are attached a loading and an unloading rope or chain. A bracket is movably attached to the frame by clasps, and a grooved pulley is pivoted in its lower end, while a similar pulley is pivoted in the upper end of an arm attached to the bracket in such way that the arm may be tipped down out of the way of the log. When a log is to be rolled upon the frame, skids are placed at the side, and the loading chain or rope is carried up over the frame and over the two pulleys of the bracket, the chain being passed around the log and its free end hooked to a staple on the inner side of the frame. The turning of the crank then winds the rope on the longitudinal shaft until the log is rolled up the skids to its place of rest on the cross pieces of the frame. To unload the log, the bracket is moved along the frame to bring it in line with the unloading rope attached to the longitudinal shaft, when this rope is passed over the pulleys and attached to the log, the upper pulley swinging down upon its arm when the latter is struck by the log as it is moved by turning the crank, which then winds the unloading rope upon the longitudinal shaft.

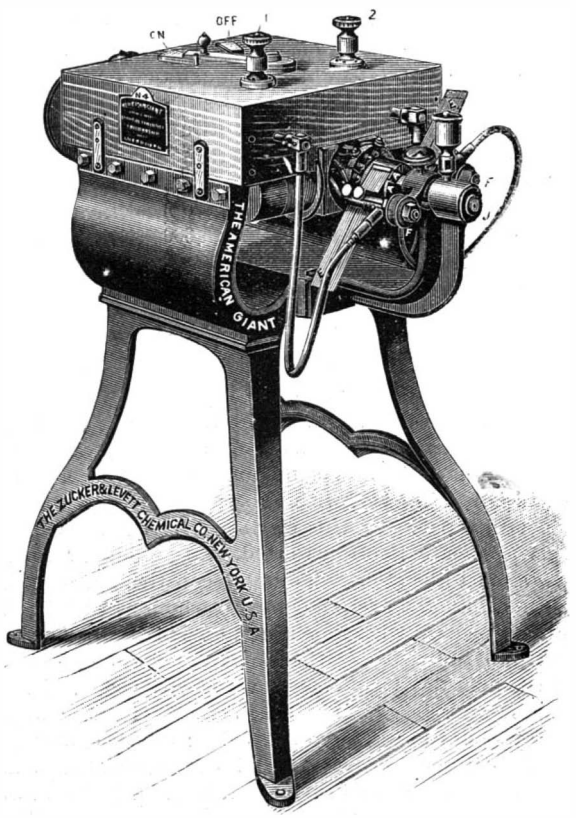


KUNTZ & ESCHENBRENER'S LOG LOADING MACHINE.

A NEW PLATING DYNAMO.

In electro-metallurgy thousands of dynamos are now used where only batteries were employed a few years ago. The advantages are greatly in favor of the dynamo. Although the first cost in the case of the dynamo appears to be considerable, it is found by experience that the dynamo effects an important saving, so great in fact as to warrant the statement that in running a 50 gallon solution, for example, for the first year, including cost of dynamo, power, and everything necessary to the use of such solution, a saving of 33 per cent is effected by the use of the dynamo. We illustrate a very efficient dynamo which is extensively used in electro-plating in all its branches and in electro-typing. It is known as the American Giant Dynamo Electric Machine, and is made by the Zucker & Levett Chemical Co., of No. 40 Murray Street, New York.

This machine is compact and self-contained. It is provided with means for regulating the current to adapt it to the work to be done. Several sizes are made, ranging from that of a dynamo operated by foot and capable of supplying a current for a 50 gallon nickel solution to that required for a 15,000 gallon silver solution and running eight horse power when run to its full capacity.



THE "AMERICAN GIANT" ELECTRO-PLATING DYNAMO

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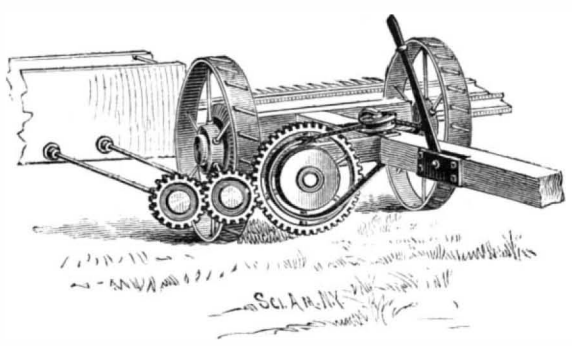
AN IMPROVED HEADER BRAKE.

This is a device patented by Messrs. Charles N. Hinchcliff and Horace E. Hall, of Spangle, Washington, to control the main driving shaft. A wooden disk is secured to the main spur or gear wheel, and a spring strap is arranged for connection with the header frame, a cord or chain being connected to the strap, the cord passing about a sheave and being secured to a pivotally mounted lever. By throwing the lever the strap is



HINCHCLIFF & HALL'S HEADER BRAKE.

brought to bear upon the peripheral face of the disk, and the momentum of the driving shaft will be checked.

AN IMPROVED STONE POLISHING MACHINE.

The illustration represents a machine for polishing granite or other stone, or for finishing or dressing the surfaces of other material, which has been patented by Mr. Willis A. Lane, of Barre, Vt. The machine is substantially built of iron throughout, and hangs on the boxes to the back shaft, which is supported by two brackets that can be bolted to any convenient place, leaving the back shaft to run free and enabling the machine to work over a large surface. The bottom bracket is made so that the machine can be plumbed in a few minutes, and thus readily made at all times to give an even pressure on all parts of the surface of the stone. The machine can be set up to work around the whole circle, so that several beds of stone can be set under the same machine at the same time. A mechanical arrangement attached to a screw provides for raising and lowering the machine by power, from the place where the workman stands, by means of a lever, without stopping the machine. Another attachment provides for raising and lowering the machine by hand. It is claimed that this is the only machine yet made by which this raising and lowering can be effected with such facility. The machine has steel-rimmed pulleys and steel shafting, with change of speed on front shaft, which is independent of the pulleys, and can be raised and lowered without raising the pulleys. The boxes are so made that they can be replaced at small expense when worn out, and the machine altogether is designed to be a most substantial, efficient, and time-saving mechanical construction. It is said to be already in use by some of the largest granite dealers in New England and the Middle States.

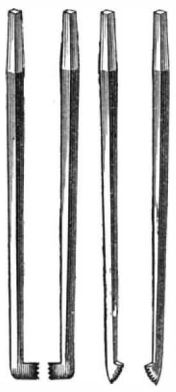
Peach Gum.

W. E. Stone, of Perdue University, Lafayette, Ind., gives, in a recent number of the *American Chemical Journal*, the results of his examination upon the carbohydrates of peach gum. He says:

The gummy substance secreted from the tissues of the peach tree contains those bodies which by hydrolysis yield arabinose and galactose. The occurrence of these bodies together under these circumstances is the more noteworthy from the fact that arabinose and galactose represent two distinct classes of carbohydrates, the true glucoses and the pentaglucoses, and are not usually found in such intimate connection with each other. The gum arabic is, I believe, the only other instance where such occurrence has been recognized, and in no previous case has the isolation and recognition of both these carbohydrates from a single homogeneous substance been accomplished.

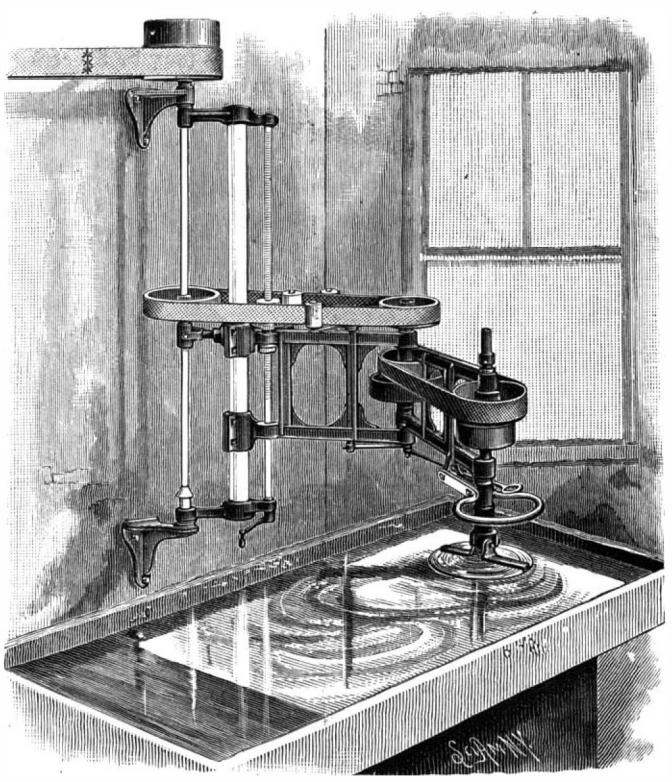
AN IMPROVED DENTAL TOOL.

The illustration represents another view of the "dental elevators" or "stump extractors" patented by Mr. Daniel Siddall, of The Dalles, Oregon, and recently noticed in these columns. The shank of the elevator, shown on the left, has a laterally extending end, one side of which is flat and the other side oval and convex, the outside edge having serrated teeth to engage the root of the tooth to be extracted and raise it entirely free from the gum, or sufficiently for it to be extracted by the forceps. The instruments are made rights and lefts, that the operator may choose one which will bring the proper bearing surface next the gum of the patient. In the elevator shown at the right the end pieces, instead of being rectangular, are fan shaped, and have a curved edge, so that the broad part of the edge or a corner of it may be brought in contact with the root.

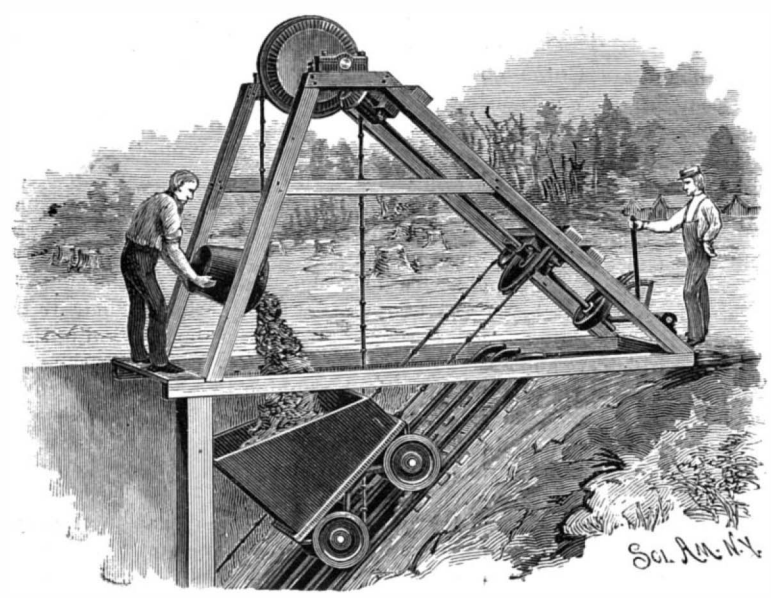


AN IMPROVED GRAVITY HOIST.

The invention herewith illustrated is designed to utilize the force of gravity in raising filled buckets from the bottom of a pit or shaft. It has been patented by Mr. William J. C. Doyle, of Aspen, Col. In the main frame of the machine a shaft is mounted at right angles to the line of two inclined tracks or ways, and on this shaft is a large sheave, about which and over a guide sheave is passed a cable, whose ends are connected to car trucks on the inclined tracks. The upper end of the shaft carries a small gear that engages a larger gear mounted on a horizontal shaft extending over the pit or shaft from which it is desired to hoist material. On the latter shaft, and directly over the pit, is a sheave supporting a bucket-carrying cable with a bucket on each end. The large sheaves are preferably about four feet in diameter, one of the gears then being one foot and the other two feet in diameter, although these proportions may be varied, while in connection with one of the shafts is arranged a brake mechanism. In operation, as the raised bucket is dumped into the car at its side, and the brake mechanism is released, the filled car will move down the track and the empty bucket descend in the pit, and in so doing will draw up the other empty car and a filled bucket from the bottom of the shaft, the hoisting being thus continuously carried on. To prevent slipping of the cables they are provided with stops adapted to be received in depressions in the peripheral faces of the sheaves.



THE "GRANITE CITY" POLISHING MACHINE.

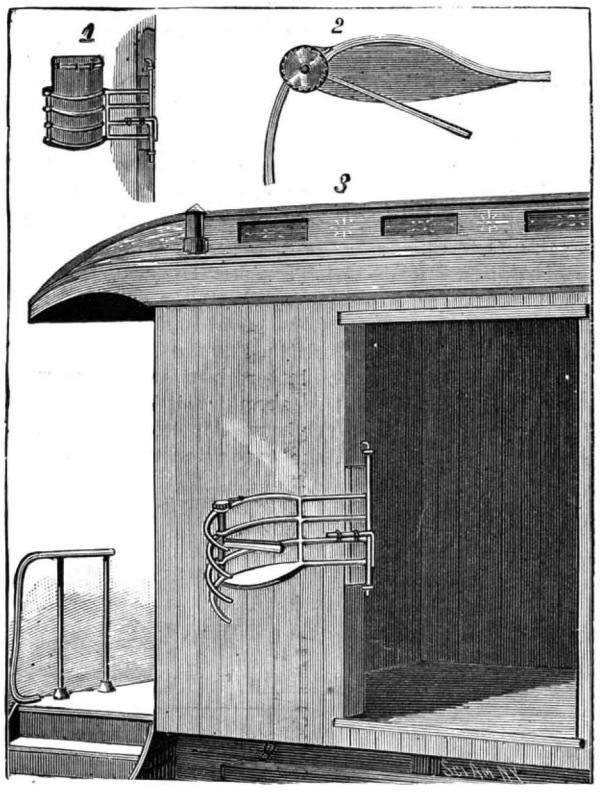


DOYLE'S GRAVITY HOIST

FURNITURE polish.—1 lb. olive oil, 1 lb. oil amber, 1 oz. tinct. henna.

AN IMPROVED MAIL POUCH CATCHER.

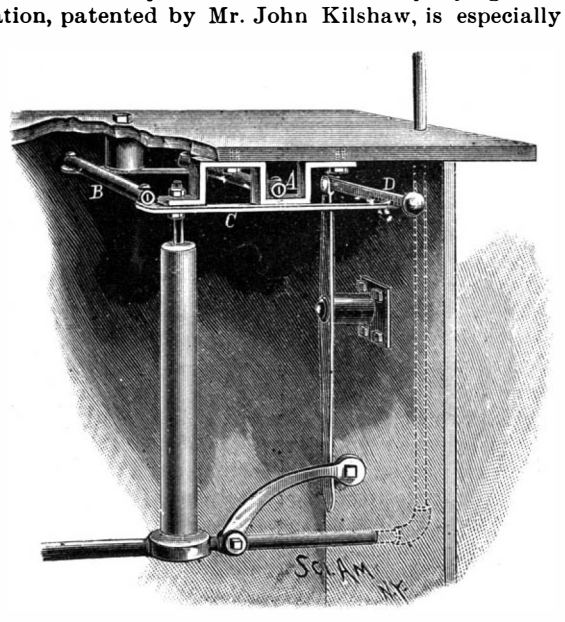
A device capable of attachment to any mail car, and designed to certainly catch and securely hold a pouch until the latter is released by the mail clerk or other person in the car, is shown in the cut, and has been patented by Mr. John A. Hatlestad, of Moss Point, Miss. A series of horizontal bars, curved for a portion of their length, are connected by an intermediate and a rear vertical bar, the latter extending above and below, and its extremities being utilized to hinge the device in a car door. The outer ends of the horizontal bars each have an eye, and the lower one is flattened in its curved portion. An outer gripping arm consists of another series of curved bars, united at their inner ends by a vertical bar held to turn in the eyes at the ends of the other bars. Upon the upper end of this pivotal bar is a ratchet wheel, the teeth of which are engaged by a spring-pressed pawl, as shown in Fig. 2, the ratchet wheel being free to turn as the gripping arm is thrown outward to receive and clamp the mail, but preventing it from opening when closed until the pawl is detached from the ratchet by the clerk in the car. At or near the center of the upright of the gripping arm is secured a plate, which extends midway diagonally across the front of the gripping arm when the latter is open, but passes between the bars as the arm is closed. In operation, as the car advances, the mail pouch strikes this plate, forcing it to the rear, and thus swings the gripping arm in upon the body around the pouch. Should the force of the blow be very great, the body of the device will be forced to a contact with an elastic strip, secured upon the door jamb in its rear, when the rebound is likely to throw the device, without the assistance of the clerk, into the car, although, upon one of the bars of the body, at its inner end, is a handle to enable the mail clerk to readily draw in the device when desired. There is an angular beveled stop block on the lower end of the pivot rod of the gripping arm, fitting in a recess in the lower bar, to hold the gripping arm in proper position until the pouch strikes the diagonally extending plate.



HATLESTAD'S MAIL POUCH CATCHER.

AN IMPROVED AUTOMATIC REGULATOR.

The device represented in the accompanying illustration, patented by Mr. John Kilshaw, is especially



KILSHAW'S AUTOMATIC REGULATOR.

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designed for automatically shutting off gas steam, or a liquid used in heating or lighting, or in driving machinery. An expansion tube, A, of brass, copper or other suitable metal, is secured at one end to a bracket permanently fixed in the immediate neighborhood of the device on which it is to be used, which is in this case the under side of the top plate of a gas stove, and the other end of the tube is pivotally connected with a lever fulcrumed on an inner bracket. The opposite end of this lever is pivotally connected with the inner end of another expansion tube, B, the latter being pivotally connected at its front end with a lever, C, having on its outer end a lug adapted to engage one of the teeth on the under side of a weighted arm, D. This arm is pivotally connected with a vertical lever on the lower end of which is a shoulder supporting a weighted lever secured on the stem of a valve held in the supply pipe by which gas or fuel is furnished to the burner. When the burner is lighted, the latter lever is swung upward and placed at rest on the shoulder, as shown in the illustration, but when the burner is extinguished, accidentally or otherwise, the expansion tubes contract,

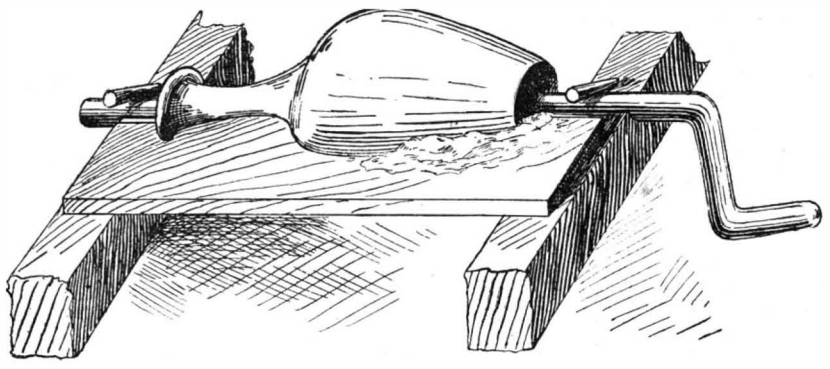

Fig. 1.—FORMING PLASTER OBJECTS.

causing the lever, C, to exert an outward pull on the arm, D, whereby the shoulder on the lower end of the vertical lever is withdrawn from under the weighted lever on the stem of the valve, allowing the latter to drop and cut off the supply of gas or other fuel. For further information in relation to this invention address Mr. G. H. Blanchard, No. 556 State St., St. Paul, Minn.

Abridgments of Industrial Liberty.

That the members of a particular profession should have laws passed in their special interest, and should be empowered to decide who may and who may not enter into competition with them, is, we think, a violation at once of justice and of liberty. The worst of these things is that a public motive is always alleged for what is in the main, if not exclusively, the outcome of private greed or jealousy. It would scarcely be too much to say that the most offensive forms of trade-unionism are found in connection with the so-called learned professions. Time was when it was supposed that the state had to look after the spiritual health of individuals; and for that purpose to prescribe their theological beliefs and religious observances. That belief has for the most part been exploded in the modern world, but its place has been taken by the notion that the state is responsible for the intellectual health of its members; and in lieu of the state church we have state schools. As regards the physical health of the community, the general method is to legalize one or two—possibly quite conflicting—schools of medicine, and to empower them to rule out, and if necessary to prosecute and punish, all others. Nobody, broadly speaking, seems to believe that, in the absence of all legislation of this character, people could in any adequate manner preserve their health or protect themselves against gross imposture. *We* believe it—believe it most heartily; and we believe that the science of medicine would advance far more rapidly, and that, on the whole, the public health would be far better, if every man were left perfectly free to employ any one he chose to attend him in sickness. At present every licensed practitioner feels himself authorized to call every unlicensed practitioner a quack. We should prefer a system under which, to a quickened public intelligence in questions of health and disease, the quack should stand revealed by his quackery. How much of real quackery is now concealed by the license to practice it might distress a confiding public to know.—*Popular Science Monthly.*

Why Crabs and Lobsters Become Red when Boiled.

The shell of the crab and lobster owes its bluish-gray color to the superposition of two pigments or coloring matters, which have been isolated—a red pigment and a blue one.

As long as these two pigments exist simultaneously, the crustaceans remain gray. But the blue pigment is very fugitive, and sometimes, under the influence of a disease, it is destroyed, and crabs are found with portions of their shell more or less reddish. When the crustaceans are immersed in boiling water, the blue pigment is entirely destroyed, and the red pigment, which is very stable, appears alone in all its brilliancy. —*La Science en Famille.*

HOME MADE ORNAMENTS.

It is sometimes convenient to form objects of circular section from plaster of Paris. This is a very simple operation, requiring only very simple tools and apparatus. An iron rod, bent at one end to form a crank, and carrying a conical wooden roller, two notched bars of wood for supporting the iron rod, and a pattern made from a thin piece of hard wood, comprise the outfit for making these articles. The rod is held in its bearings in the bars by pins inserted obliquely in holes in the wood, so as to project over the rod. The pattern is cut so that its edge is a profile of one side of the article to be made. The wood should be made thin on the working edge. The patterns may be made to advantage of metal backed by wood.

The conical wooden roller should be flattened on three or four sides to prevent the plaster from turning around on it. The roller is oiled or smeared over with grease, and a batter of plaster of Paris is prepared by mixing the dry plaster with water to the consistency of cream. As soon as the plaster begins to set it is applied plenteously to the roller, and while the rod is turned by means of the crank, the pattern is moved forward toward the rod, and the surplus plaster is removed by the pattern, which acts as a scraper. Any deficiencies are supplied by a new application of the batter. When the object is of the right size and form, the pattern is removed and cleaned, and again applied to the object, the latter having been brushed over freely with water. This gives the finishing touch.

The principal difficulty in making wooden imitations of pottery lies in the liability of wood to a change of form by shrinking or by the absorption of moisture. This can be avoided, however, by selecting very dry wood to begin with, and allowing it to further season after being turned or otherwise shaped.

Although a great variety of articles may be successfully made of wood and finished in imitation of pottery, only one example will be given (Fig. 2). This is a

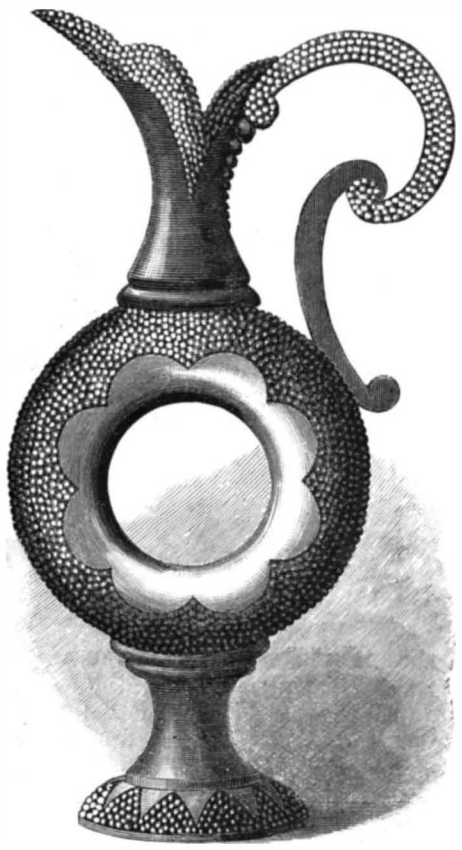

Fig. 2.—WOODEN PITCHER, FINISHED IN IMITATION OF POTTERY.

pitcher having an annular body with moulded base and top. These parts are made of well seasoned pine glued together, and further secured by screws. A hard wood handle is firmly attached, and the whole is varnished with shellac varnish and allowed to dry thoroughly. A design is drawn on the pitcher and filled in a portion at a time with shellac varnish, slightly colored with some pigment. Before the varnish becomes entirely dry the surface is covered with bird shot No. 6, which adheres and forms a nodular surface. When all the varnish-coated surfaces are covered with shot, the varnish is allowed to dry, after which the entire vase is painted with white or cream-colored oil paint.

After the first coat is perfectly dry it is smoothed with fine sandpaper. A second coat of the same kind is applied, and when dry, smoothed as before. The paint for the final coat is mixed with varnish to give the vase a gloss. As soon as this coat becomes tacky, the parts covered with shot are brushed over with a piece of chamois skin sparingly charged with gold bronze powder. This gilds the projecting convex surface of the shot, leaving the rest of the original color.

The effect is fine. This vase, if made 20 or 24 inches high, may be placed on the floor in any suitable nook or corner.

Suggestions by a Photographer.

A prominent photographer, interviewed recently by a representative of the New York *Sun*, has given a number of valuable hints. This photographer says, what has been said many times, that few people stand before a camera without the expression, "I am having my picture taken," defeating their own object. The second difficulty is that materials having a gloss never produce good effects in a picture; but the majority of women, though they may own any number of dresses that fall in soft, clinging lines, persist in wearing new glossy materials that have not become adjusted to the figure.

There is nearly always the possibility of producing an attractive if not a beautiful picture of a child, if the child is left for direction to the photographer. In reply to the question, "What is the most annoying thing about your work?" the answer was:

"Oh, the fond mothers who insist on dressing children in garments heavy with frills, instead of the soft, fine little dresses that fall in pleasing lines. Then, too, they insist sometimes on having a foot or shoulder, or more often a sash or shoulder knot, show, to confusion of art and the destruction of unities. Or they will dart out and twitch a little skirt or mantle that has fallen into natural curves of beauty, or a wandering curl, that falls in exquisitely careless grace, back into order and awkwardness again. That happened the other day when I was photographing a bride. She walked up to the chair, and as she turned to face me the silk train and thin veil fell in wonderful folds of graceful outline. I told her not to stir, but while I stepped back to get the effect, her friend darted out and straightened the whole thing out like a flag in a head wind."

The same lack of artistic sense that placed the furniture in a room at right angles still thinks the straight line the line of beauty, curves representing disorder.

Pilot Search Light.

The steamer Connecticut, of the Providence and Stonington Steamship line, has been equipped with a new Huntington search light. Men have been employed on the big boat for the last few months constructing the light and getting it in running order. They accomplished their task only a few days ago, and now the big Connecticut can forge its way through Long Island Sound during nights when fog dims the eyes of the ever-watchful pilot, without much fear of collision. The wonder is how the Long Island steamers ever managed to do without the search light.

It is located on top of the pilot house, and is played on any quarter desired by the pilot within. At his will he can throw the powerful light toward the sky or water, and all by the means of a little wheel with a switch. On a very dark night objects at a distance of two miles away can be seen quite plainly. When fog is dense, the light is thrown a distance of half a mile. By means of a weight that may be operated by a magnet, the steam fog horn of the vessel is also brought under the control of the electric current.

In the pilot house there are four switches controlling the current that runs to the search light and the fog horn, and by means of these switches the pilot can start the search light so that it will flash at regular intervals automatically; or it may be made to burn steadily; or it may be made to flash automatically at the instant the fog horn begins to bellow, and cease to flash when the bellow ceases; or the horn may autotomatically bellow alternately with the flash of the light; or the flashing and bellowing may be done alternately or simultaneously by hand. No such use of electricity was ever made before.—*Providence Journal.*

Accident on the Alliance.

On the U. S. steamer Alliance, now on her way to China, on the morning of the 9th ult., while the ship was cruising in the Mediterranean and the crew were at target practice, Boatswain's Mate J. McGowan was instantly killed by the premature explosion of a sixty-pounder breech-loading rifle. He was captain of the gun, and was in the act of locking the breech mechanism when the cartridge exploded, blowing the plug entirely through his body.

Commodore Taylor ordered a board of officers to investigate the cause of the explosion. Their report only deepened the mystery. They could find nothing to show that the primer had been placed in the vent, as ordinarily its shell remains in the vent when exploded, and there was none to be found on this occasion. McGowan was known to be a careful gunner, well acquainted with ordnance, and he had taken every precaution.

The board came to the conclusion that in the turning of the breech plug into place the metal must have struck a spark and ignited the cartridge. No blame was attached to any one for the accident.

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THE SODOM AND BOG BROOK RESERVOIRS IN THE CROTON BASIN, N. Y.

It is well known that for some time past New York City has been suffering from a scarcity of water. The new aqueduct, after a period of nearly six years, is now complete. Unforeseen delays increased the time occupied in its construction to more than double the anticipated period. The present watershed capacity in the Croton region, at least during the past two years, has been sufficient to insure a largely increased supply if the new conduit had been put in operation. The old aqueduct, with a maximum capacity per day of about 100 million gallons of water, has not been able to bring to the city more than one-third of the Croton supply. A long series of observations shows that over 276 millions of gallons go to waste on a daily average over the dam. This, of course, is not a constant flow; long periods will elapse when not a drop will escape, while a much larger amount than this will go to waste in a single day during the spring or fall after wet weather. It is, therefore, obvious that additional storage is needed. The water must be impounded during periods of freshet to be delivered during the dry period. If this is done, the capacity of the new aqueduct will be more available. It is placed at 318 million gallons per day to Jerome Park. Of this amount 68 millions are intended for the annexed district, the rest for Manhattan Island proper.

We illustrate in our present issue the work in progress in the Croton Basin upon what is known as Double Reservoir I. This includes the Sodom dam upon the east branch of the Croton River and adjoining it the Bog Brook reservoir upon the branch of the Croton River bearing that name. These two structures will form basins of a capacity of 9,000 millions of gallons. The capacity of the existing reservoirs is 8,700 millions of gallons. Thus, when the Sodom and Bog Brook reservoirs come into use, the reserve of water will be doubled.

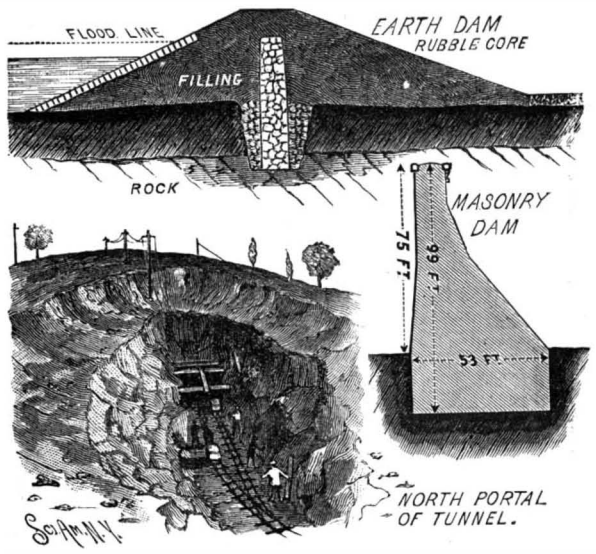
The Sodom dam is a masonry structure, as regards the dam proper, while to one side is the spillway, which is formed upon an earthwork dam. The general dimensions of the masonry dam are as follows: height, 88 ft.; length, 500 ft.; width on top, 12 ft.; width on the bottom, 47 ft. The spillway is 10 ft. below the crest level of the dam, and is 500 ft. wide.

Adjacent to the Sodom dams, which, it will be observed, inclose a single reservoir, are the two Bog Brook dams, also forming but a single reservoir. The general dimensions of the shortest one of these, which is sharply curved, and which may be termed the gate house dam, is as follows: Height, 65 ft.; length, 1,300 ft. It is for most of its length an earthwork dam with masonry core. The core of this dam is 4 ft. wide at the top and 10 ft. wide at the bottom, varying in height with the ground. On the reservoir side the slope of the dam is two to one; on the outside, two and one-half to one. It is 25 ft. wide at the top, and 308 ft. wide at maximum on bottom, with a maximum height as stated above. The other dam, which is only slightly curved, is 1,925 ft. long, is all earthwork with rubble core and is paved on the water side. On top it is 12 ft. wide, maximum at bottom 90 ft.; maximum height about 18 ft.; the core is 2 ft. 6 in. wide at the top and 4 ft. at the bottom. The dam slopes on both sides with a batter of two to one. Both are paved on the water side. In the construction of all the earthwork dams, each 6 in. layer of earth was watered and rolled in place, so as to secure the most compact kind of work.

The two reservoirs communicate with each other by a connecting tunnel; it follows a straight line, and is circular in section, with a diameter of 10 ft. It is 1,800 ft. long. Where it connects with the reservoirs the circle is changed into an ellipse, a uniform area being preserved. It is lined with three to four courses of bricks, and is buttressed and supported by rubble masonry in accordance with the requirements of the ground. It is provided with a single gate, so that the reservoirs can be disconnected when necessary. The Bog Brook reservoir has no spillway, the one spillway being relied on for both reservoirs.

While thus connected with each other, independent gate houses and outlets are supplied for both reservoirs. The Sodom dam has three 48 inch outlets placed at surface, high and low level. The lowest outlet is at the bottom. The next is 30 ft. above it, and the surface, outlet is 59 ft. above the bottom. These pipes are embedded in the masonry, and are carried through the dam in this way. They are provided with permanent valves, and there are stop plank grooves in the masonry, forming the sides of the valve chambers or wells for the introduction of temporary wooden barricades in case of repairs or other necessity. Leaving the valve wells, two 48 in. pipes are carried out to a point beyond the base of the dam, and are for this portion of their course supplemented by five 12 in. pipes. Some distance below the dam these pipes terminate and deliver their water in a fountain or geyser. The object of this is to commence the work of aerating the water for the purpose of purification. It is well known that oxygen destroys much of the organic impurity of water, and the geyser delivery is designed to utilize this property of the oxygen of the air. The Bog Brook reservoir for outlet has two 36 in. pipes. These are carried through a tunnel of about 10 ft. general height, and passing out beyond the base of the dam form a geyser.

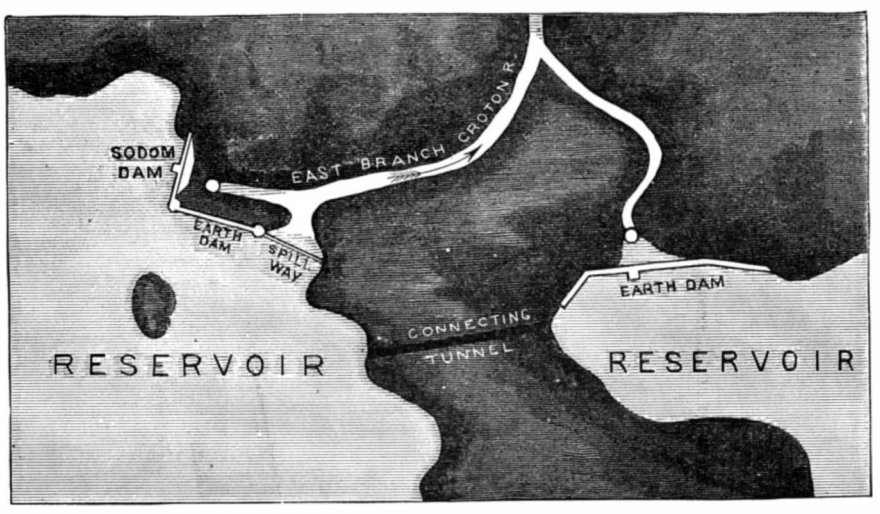
The functions of this double reservoir are clear. During periods of great precipitation of rain, the outlet valves will be closed and water will accumulate until it begins to pass over the spillway; from the spillway it will run by the natural water course down to the Croton Lake, so that the latter will receive its full and normal supply. In periods of dry weather, on the other hand, when the level of the Croton Lake tends to fall, and when no water passes over the spillway of the Croton Lake dam, the outlet valves of Sodom or of Bog Brook reservoirs can be opened. Water will pass out of the geysers, and by the same natural water courses will reach the Croton Lake and replenish it.



DETAILS OF SODOM DAM AND TUNNEL.

The new Central Park reservoir has a capacity of 1,000 millions of gallons. The double reservoir we are just describing has nine times this capacity, or will hold nearly three months' supply of water. It will be seen, therefore, that it will be a very important auxiliary to the water supply of this city, and that it will perform a specially important work in conjunction with the opening of the new aqueduct. It is definitely certain that the year 1891 will see us far removed from all danger of a water famine, not only on account of the new aqueduct, but also on account of the increased storage capacity made in the Croton basin by the double reservoir just described.

One of the illustrations on our first page shows how the reservoirs will appear when completed. The other one shows the present aspect of the work. One of the large pipes, it will be observed, is seen in use as a drainage conduit. Eventually it will be prolonged, and its end will be upturned in order to contribute to the geyser or aerating fountain. The small cut gives a good idea of how the two reservoirs are situated with respect to the line of the connecting tunnel.



SODOM AND BOG BROOK DOUBLE RESERVOIRS AND DAMS.

The Hairs of Your Head Numbered.

Some writer has said that the average number of hairs on the human scalp vary from ninety to one hundred and twenty thousand.

There are a good many heads about the office of this paper which would hardly bear out either statement. But that a single hair can support a weight of two ounces and is so elastic that it may be stretched to one-third of its entire length, and then regain its former size and condition, can be done, according to an assertion in the *Southern Critic*, by C. C. Benson.

Among the 'Phones.

During the recent meeting of the Editorial Association, in Boston, some interesting experiences were had by the members. The delegates and their friends accepted an invitation of the Boston Press Club to visit its rooms on Bosworth Street and listen to an exhibition of the wonders of the long distance telephone. Communication was established by the American Telephone and Telegraph Company between the club parlor and the company's exchange at 18 Cortlandt Street, New York A long distance telephone and a large number of hand 'phones were placed in the clubroom, and four courteous young men were placed by the company in charge of the exhibition. When the entertainment was begun, the parlors were filled with ladies and gentlemen wearing the badges of the association. The first feature was the transmission of music on the piano and cornet from the New York Exchange, 234 miles distant, the music being made easily audible to every person in the rooms. "Little Annie Rooney" was liberally applauded. So were some less popular but equally familiar airs. Sounds from a phonograph were also heard by means of the hand 'phones. Later the operators made connections with the Broadway Theater and the Casino New York, and Keith's Gaiety and Bijou, Boston; and snatches of popular operas were heard as distinctly as the cornet and piano music had been. The strum-strum of a banjo was not forgotten in the display of melody. That came from the telephone office in Newport, R. I., where they had a very expert strum-strummer at work. The exhibition was a revelation to many of the visitors, but it did not surprise them. Nothing surprises newspaper men.—*Mod. Light and Heat.*

An Automatic Chair.

A company is in course of formation, says *Money*, an English newspaper devoted to financial matters, and will make its appearance shortly, to acquire the business, patents, concessions, and stock in trade of the Patent Chair Contract Company, limited. The specialty is an invention which may truly be said to meet a long felt want. The seat of the chair is hinged at the rear, and in its normal position is folded up against the back, and cannot be pulled down. Upon dropping a penny into a small box affixed to the side of the chair, the fastening is unloosed and the seat can be pulled down for use, and the chair sat upon. When the occupier rises to quit the chair, the seat is automatically folded up to the back again by a spring, and the chair cannot be further used until another penny has been dropped into the box Should the occupier only wish to leave the chair temporarily, an umbrella, a stick, or a newspaper placed on the seat prevents it closing fast. Thus in parks, public gardens, or places of public entertainments, where seats have to be paid for, which is the custom abroad, the public can always help themselves to a seat without the unpleasantness of being watched and followed up by collectors.

The Preservation of Rolled Iron Plates from Corrosion.

Mr. T. P. Bruce Warren has communicated to the *Chemical News* some observations on the corrosion of boiler plates, which also bear upon other similar structures of sheet or plate iron. It is well known, as Mr. Warren remarks, that a rolled iron plate has a skin or surface which resists oxidation. If this skin is removed by scratching or filing, the new surface rusts rapidly on exposure to damp air. If a freshly rolled plate is cut, the surface remains intact, while the edges rust in a very short time. If the iron is immersed in dilute acid, the skin-coated surface resists the action more or less, while the cut edges are rapidly attacked. This difference Mr. Warren ascribes to the altered electrical relations of the surface—one being much more electro-positive than the other. Pitting of plates can be explained in the same way. The only remedy is the entire removal of the surface of the plate after rolling, which would result in the presentation of a uniform surface less likely to promote local chemical action. The utility of a magnet for determining inequalities in a rolled iron plate seems to Mr. Warren problematical; but the difference of potential between two plates when immersed in the same liquid, which might be observed by means of an electrometer, would reveal the existence of chemical or physical differences of structure that might be favorable to corrosion. Care must be taken to keep a boiler in an electro-negative condition, which is done by suspending inside it, in a manner to preserve perfect metallic contact, a lump or plate of zinc. Whenever a boiler so fitted is cleaned, and the zinc put back, the perfection of the metallic contact must be carefully seen to. If an impure zinc is used, the surface dissolves, leaving a preponderance of lead, which puts the iron of the boiler into an electro-positive condition, and corrosion ensues.

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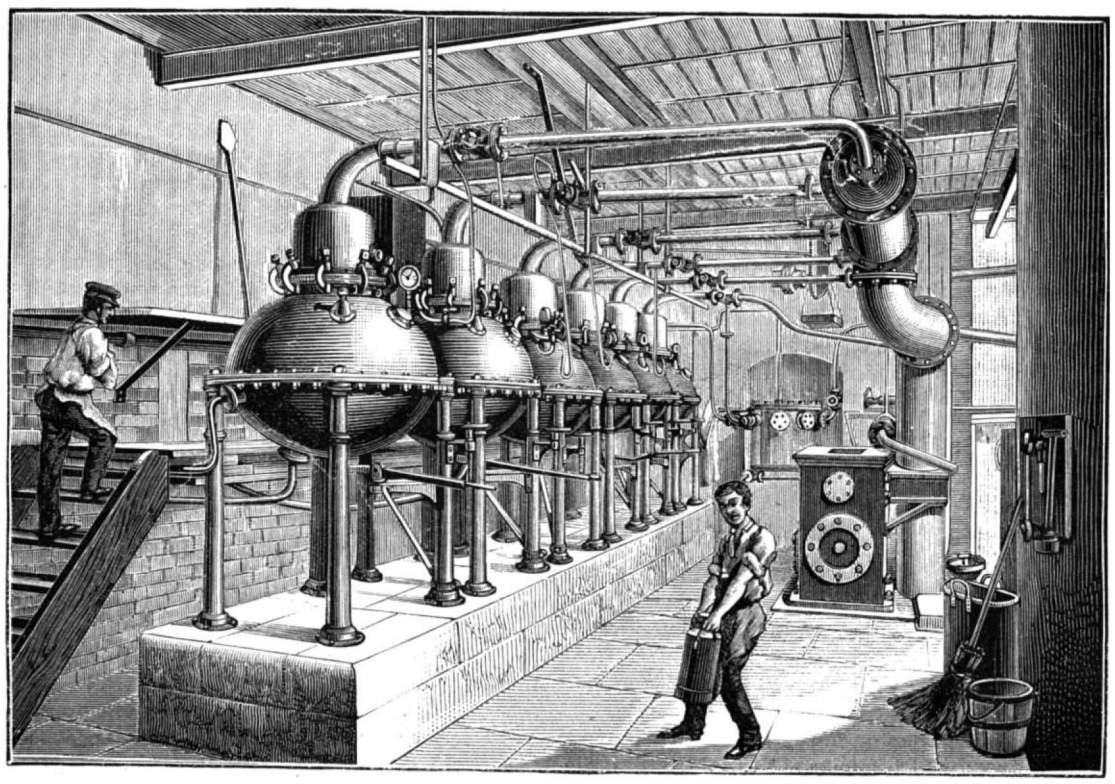
MANUFACTURE OF CONDENSED MILK IN SWITZERLAND.

Switzerland, says *La Nature*, to which we are indebted for the accompanying engraving and article, stands at the head of the condensed milk industry. The milk manufactured in this country is unsurpassed. Although other countries may produce milk which produces better butter, as for example Normandy and Holland, none of them can rival Switzerland in the delicious flavor, the delicate aroma, and excellence of quality of condensed milk. This is due, no doubt, to the richness of the flora of that country.



THE SWISS METHOD OF CONDENSING MILK.

The milk industry, which during the past few years has developed abnormally in Switzerland, is conducted principally by three companies or firms—the Anglo-Swiss Company, with factories at Cham and Guin; the Lapp Factory, at Epagny; the Henri Nestle Company, with factories at Vevey, Bercher and Payerne.

The milk export (and here the amount of export is equal to the amount manufactured, as the home consumption is very slight) has increased, according to the figures of the federal bureau of customs, in 1887 to 111,312 metric quintals, or 494,720 cases of 48 boxes each, in 1888 to 117,700 metric quintals, or 520,000 cases, which represent the milk of 15,000 cows and of 250 villages. In 1888 the export of Swiss cheese amounted to 238,390 metric quintals, which represented a value of 30,450,000 francs. We mention these figures to let every one comprehend the importance of this new industry, whose exports are already one-half as great as the much older industry of cheese making.

Condensed milk is manufactured as follows: The milk, as soon as drawn, is taken by the farmers to the dairies, which are established in each village or group of villages. The dairies are run by a syndicate with which the manufacturers deal, and establish the fixed prices. Here the milk is cooled. On reaching the factory the milk is warmed for the first time in a water bath, and a second time in copper vessels, where the temperature reaches 80° C. It is then sweetened by adding the best quality of sugar in the proportion of 13 to 100 in weight, the sugar being forced into vacuum pans by means of a pump. These vacuum pans are for condensing the milk, and are similar to those for condensing the juice of the beet root, having a double bottom and spiral pans in which the steam circulates. The water contained in the milk is removed in the form of vapor by means of a jet which is connected with the top of the vacuum pan and which is operated by means of a pneumatic pump. When the milk has been sufficiently condensed it is removed from the vacuum pans and cooled in vessels placed in reservoirs of running cold water. It is only necessary now to pack the milk into tin boxes cylindrical in shape, and hermetically sealed, the box and contents weighing one English pound, and being in condition for shipment to any part of the world.

In the preparation of the condensed milk it may be observed that the milk, as taken directly from the cow, has on the one hand simply been deprived of the water it contained, while on the other hand the only addition consisted of pure sugar, which is designed to preserve the milk better. It contains all the elements of the fresh milk, which has practically undergone no modification, the boiling of the milk under slight pressure having never passed 80° C. It can be affirmed, therefore, that the condensed milk possesses all the nutritive qualities of fresh milk. The following analyses, one by Prof. Soxlet, of the University of Vienna, and the other by Mr. Otto Hehner, the distinguished chemist of St. Thomas' Hospital, London, show the chemical composition of the Swiss milks:

	Milk Nestle.			Milk of the Anglo-Suisse Co.		
	Dr. Hehner.	Dr. Hehner.	Soxlet.	Dr. Hehner.	Dr. Hehner.	Soxlet.
Water	23 59	25 04	25 28	24 21	26 44	24 70
Fatty matter	11 58	11 12	8 62	9 95	10 52	6 02
Caseine	9 60	8 18	10 25	8 72	8 22	9 77
Sugar	53 21	53 78	53 82	55 18	52 86	57 40
Salt	2 02	1 88	2 03	1 94	1 96	2 11
	100 00	100 00	100 00	100 00	100 00	100 00

These analyses are confirmed by analyses by Dr. Brunner, Professor of Chemistry at the University of Lausanne, and Dr. Christen, of Paris.

The problem of preserving milk is solved. The milk may be preserved for several months, and the flavor is very agreeable. We do not need to mention the various uses to which it may be put, nor how extensively it is used in all extensive communities, on board ship, in our colonies, and in all countries where fresh milk cannot be obtained.

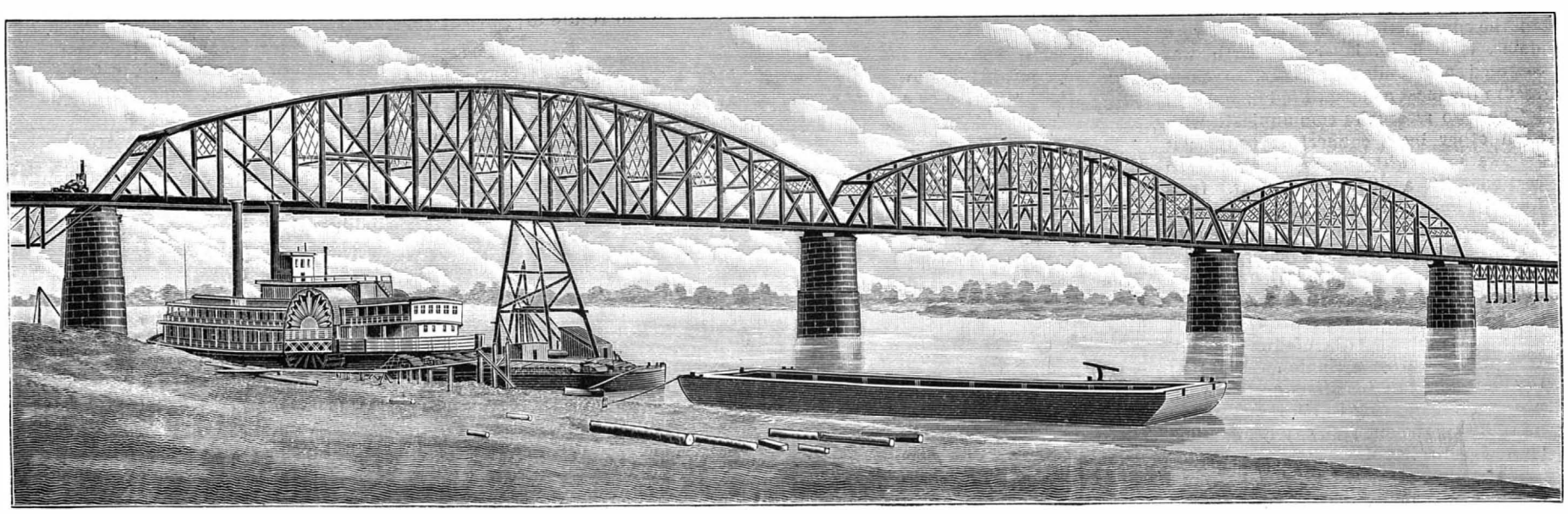
NOTE.—It should be borne in mind that the manufacture of condensed milk was first introduced in America, and was the result of American invention. Mr. Gail Borden, the original inventor of the process of condensing milk *in vacuo*, procured his basic patent in 1856. An enormous industry has been founded upon his patents, and although we do not question that Switzerland may excel in this manufacture in Europe, we believe that the United States, both in respect to volume of manufacture and excellence of quality, distances all competitors.—ED.]

THE NEW MERCHANTS' BRIDGE AT ST. LOUIS.

The accompanying illustration is a reproduction from a photograph of the Merchants' bridge at St. Louis, which was completed and dedicated with considerable ceremony on May 3. The main superstructure of the bridge consists of three spans, each of which is 517 feet 6 inches in length. It is of the Pratt truss form and divided into 18 panels. These trusses are 75 feet high in the center, and are placed 30 feet apart from center to center transversely, thus providing room for two tracks which are placed 12 feet apart. The system of lateral bracing is carried down the post to within 21 feet of the railroad track. The east approach to the bridge consists of 3 deck spans, each 125 feet in length. These rest upon piers composed of 4 cylindrical columns. Beyond this iron work there is about three-fifths of a mile of wooden trestle work. Where the approach passes over the Alton, Big Four, and Wabash railroads, there is a steel span 175 feet in length, resting upon masonry abutments. The trestle work will, doubtless, be filled in at a later period. At the west end the approach also consists of three spans, each 125 feet in length. Beyond this portion of the bridge there is a steel girder spanning one of the streets of the city, and about one-quarter of a mile of trestle work, which also will be filled in to make a solid embankment. The bridge track is laid with steel rails weighing 67 pounds to the yard, secured to the ties by Bush interlocking nuts to prevent the creeping of the rails. The superstructure of the bridge consists of four piers, composed of granite from a point 3 feet below the low water line to 2 feet above the high water line. Above this the material used is limestone, and between the granite and the caissons is the usual crib work, except in the case of the second and third piers, where the masonry had been started from a caisson.

The first soundings for this bridge were made in September and October, 1887, and the report and plans of the engineers, Messrs. Morison & Corthell, were submitted on November 2, 1887. The first caisson started was that for pier No. 4 on the west end. This caisson was built on the site and lowered in position. Work upon it was commenced January 24, 1889, and the pier was completed early in July. The caissons for the piers 1, 2, and 3 were built upon the banks and floated into position. No. 1 was launched April 26 and the pier was finished August 24. Caisson for pier number 2 was launched May 23, and that for number 3 on June 6. The location of pier number 3 is such as to expose it to the strongest current in the river, and the only difficulty of moment experienced in the work upon the substructure was at this point. The caisson was placed in position September 9 and the pier finished November 1. When towed into position the depth of the water at this point was 18 feet, but before the work was completed a rise in the river increased the depth to 42 feet, and the strength of the current was such as to tear away the anchorages twice.

In erecting the superstructure, some very quick work was done. The false work for the west span was begun,



THE NEW MERCHANTS' BRIDGE AT ST. LOUIS.

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early in October and finished November 1. The building of the span was begun November 9 and completed on the 17th. The second span was erected between December 5 and 11. The false work for the three spans was completed December 22, and the span itself was started December 23, and made self-supporting December 30; but 60 working hours were employed in the erection of this last span.

The bridge was dedicated on May 3, with imposing ceremonies. St. Louis took a half holiday, and the river was crowded with large steamers which had been chartered for the occasion, each of which carried many to the scene. At 2:30 P. M. trains started from the Illinois and the St. Louis ends of the bridge, each bearing the governors of the respective States. They met in the middle of the bridge and exchanged courtesies. The bottle of wine was broken as usual and a salute of 100 guns fired. In the evening there was a banquet at the Lindell hotel, at which several more bottles of wine were broken and numerous speeches were made. The banqueting hall was finely decorated. The guests as they entered passed under a large floral representation of the bridge. St. Louis now has a bridge which has been very much needed for a long time, and when all connections to it are completed, it will advance the interest of the city materially.—*Railway Review.*

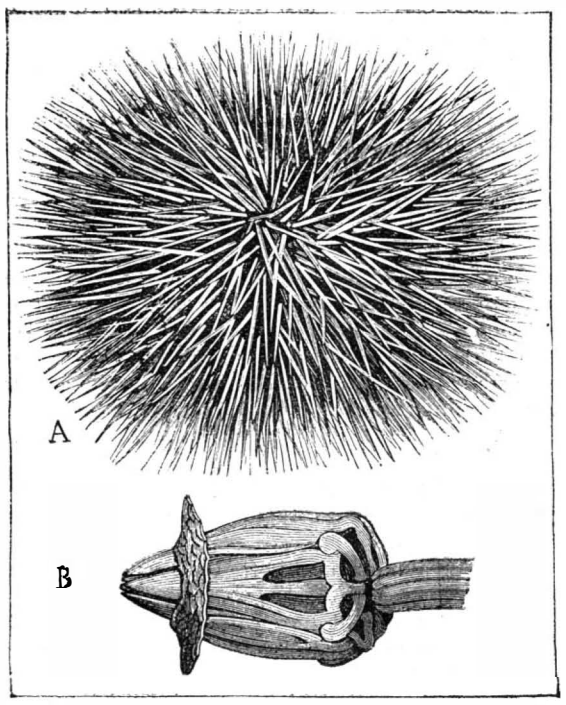

Fig. 1.—A. SEA URCHIN. B. BUCCAL APPARATUS.

BURROWING SEA URCHINS.

It has been known for many years that certain sea urchins form cavities in the rocks of the seashore, and are often found nestling in them. Mr. E. T. Bennett studied this fact so long ago as 1825, and made known an important point in showing that the habit under consideration is not the characteristic of any species in particular. Mr. Walter Fewkes, in the *American Naturalist* of January, 1890, has taken up the study of the phenomenon in question, and appears to us to have made a very good *resume* of it. Our readers will, perhaps, be glad to know the conclusions that the American writer has reached.

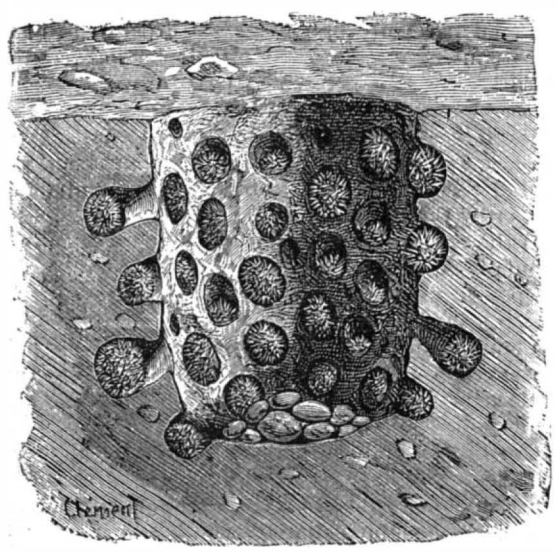

Fig. 3.—A SEA URCHIN BURROW.

According to Bennett, a number of authors (cited by Mr. Fewkes) have in turn touched upon the matter. They have found that the excavation in question may be observed in the most diverse rocks—granite, lava, gneiss, limestone, chalk, etc.—and in all parts of the globe. Where the sea urchins abound, the excavations are so numerous that the ground is riddled with them. They are sometimes found in the horizontal masses of the rock and sometimes in the more or less vertical sides of the latter, and are of sufficient dimensions to allow the animal to move about a little. They are often carpeted in part, at least around their orifice, with different calcareous algæ. It was believed for a long time that these algæ might play a part in the production of the excavation. It was thought that they might, like other plants, moreover, exert a chemical action upon the rock and progressively dissolve it. In reality, there is nothing in this, as appears from a number of facts, and the sea urchins are the sole makers of the cavities in which they are found. It is well to say, however, that a sea urchin discovered in such a cavity is not necessarily the architect of the dwelling place in which it is found. It often happens that a sea urchin, in search of a domicile, meets with an empty cavity, the owner being dead, or perhaps wandering around the vicinity, no matter which—the new comer does not bother itself about that, but at once takes possession and makes itself at home. It is not really known whether or not the sea urchin sometimes leaves its cavity in order to explore the vicinity, and afterward returns to its dwelling after its curiosity or its hunger is once satisfied. It would not be impossible to find out, however; but we know with certainty that the animal, in the course of its peregrinations, seizes upon any such empty lodging as it may find to its convenience. That is to say that, among the tenants, there are some that construct their own abode, and there are still sharper ones that know how to take advantage of the labor of others. However, it is doubtless necessary for them to work a little, for we often meet with sea urchins in cavities whose orifice is too small to have allowed them to pass through it. These have entered when small, and, in growing, have enlarged their domicile (Fig. 4).

How is the excavation made in the rock, and how does the animal enlarge its abode? Here, as is not rarely the case in scientific matters, opinions differ. One observer will have it that the sea urchin, in moving about, wears away the rock with its spines, which act after the manner of files. Another believes that the animal burrows into the rock by means of its teeth, which are very curious and powerful, and which the muscles of the lantern of Aristotle (such is the name of the dental apparatus of sea urchins) set in motion. A third observer comes to the front and, deciding both for and against his predecessors, admits a portion of the two hypotheses, or rather combines them. In his opinion the teeth and spines must act together. It seems, however, that the greater part of the work falls to the teeth. This appears to be shown by the following fact (pointed out by John), of the presence of fragments of rock in the sea urchin's intestine. We know, moreover, that all the sea urchins swallow much sand and rocky debris, although the utility of this habit is not very clear to us.

On another hand the spines may act as follows: We know that water in motion often excavates pretty large cavities (such as the large pot holes of Switzerland and the Jura) by means of the grinding action that it communicates to stones. These latter, continuously rubbed against the same part of a rock by the current, wear away the rock and become worn themselves. The rock is gradually hollowed out into a cavity of variable dimensions, and at the bottom of this we often find the round, smooth stone that has served to form it. The body of the sea urchin, slightly agitated by the waves, may act upon the rock to which it is attached and gradually hollow out the latter; and what seems to show that such a thing occurs is the polish and evenness of the cavity occupied by the animal. It would be difficult for the teeth to act with such uniformity. It is probable that this is what occurs: The sea urchin naturally tends to search for depressions in order to protect itself against currents. These it enlarges with its teeth, and the motions of its body wear away the rock at the points where it comes into contact with it.

Some naturalists have thought that the animal might be aided in its work by acid secretions furnished by the mouth, ambulacra, etc. But the existence of the latter has not been ascertained, and their nature at the most would be pretty difficult to conceive of by reason of the variety of the rock that they would have to act upon.

Mr. Jules Marcou, of Cambridge, furnished Mr. Fewkes with a very interesting note, in which he narrates some facts observed by him at Biarritz, where he saw a number of cavities formed by the usual mechanism (wear of the rock by stones set in motion by waves and currents), and in the sides of these he observed large numbers of sea urchin dwellings. In certain cases, the cavity exhibits a central column, which starts from the bottom (Fig. 4). This may be supposed to be due to the fact that the stones have had a very rapid motion that has kept them constantly at the periphery. As the central part of the depression has not been worn away by the stone, it remains in the form of a column. In measure as the excavation becomes deeper, however, it diminishes in diameter, and the column does the same, and finally breaks off. The figures given by Mr. Marcou make the mechanism of the phenomenon well understood. In these excavations, whether they are or are not provided with a central column, the sea urchins abound, each having its lodging, and the excavations being sometimes so close together that it is impossible to find a surface in which to form a new cavity. It would seem that the sea urchins play a very active part in the production of the burrows, and Mr. Marcou thinks that the animals sometimes begin these by excavating their niches alongside of each other. And now, why do the sea urchins excavate niches? If we take account of the very interesting fact that the habitude is scarcely found except among littoral sea urchins at points where the currents are strong, the tides powerful, and the waves numerous, it will be seen that there are two principal reasons to be invoked. Where the sea is rough (and there the animals are generally abundant, the surroundings being favorable to life), the sea urchin excavates in order to protect itself against the motion of the sea. Moreover, where the tide runs high, another motive comes in play. The sea, on retiring, leaves the animal high and dry for a few hours, and this is not advantageous to it. It therefore excavates a niche wherein the water can remain between tides. It makes for itself a little sea which guarantees it against drying, and, when it works in community, and installs itself in a burrow, it finds itself in still more advantageous conditions, the quantity of water that remains in the burrow, and that laves the niches of the animals, being still greater. The fact that the sea urchins protected against the action of the waves, currents, and tides, and living at a certain depth, do not form cavities in rocks, renders the explanation just given very likely. The facts so well interpreted by Mr. Fewkes might be verified by a new observation, and this would not be difficult to make. In the course of such a study it would be interesting to observe the relations of the sea urchins to the algæ growing around the orifice of the niches, and to find out whether there is not here a fact in the line of symbiosis. We know that beings that are very different sometimes render each other mutual services. Does a relation of this kind exist in the present case, and what is it?—*La Nature.*

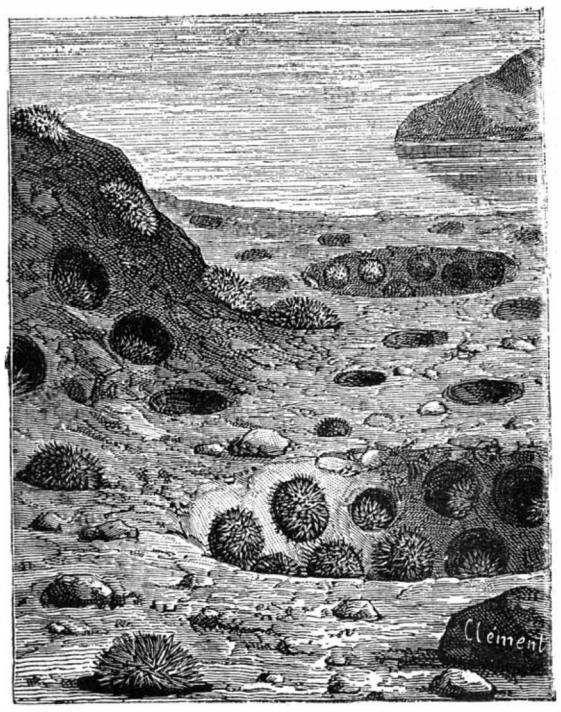

Fig. 2.—BURROWS OF SEA URCHINS.

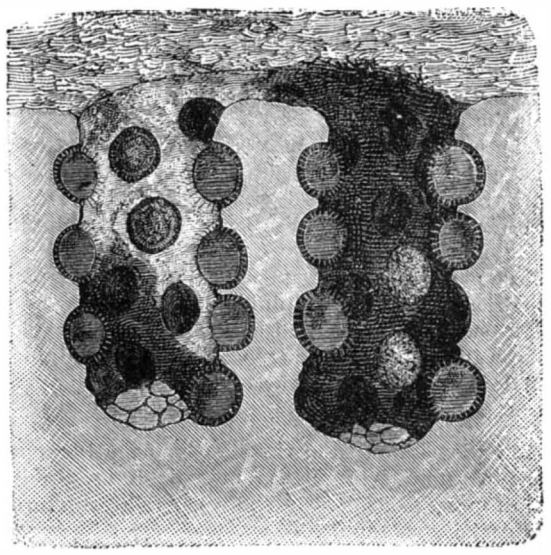

Fig. 4.—DETAILS OF THE BURROW.

ACCORDING to *La Nature*, the *Histoire de l'Academie des Sciences*, of Paris, of the year 1752, records the fact that the property possessed by India rubber of erasing pencil marks was discovered at about that epoch by Mr. Magellan, a descendant of the famous navigator whose name is perpetuated in the strait discovered by him at the southern extremity of South America. Previous to this, bread crumbs had been used as a pencil mark eraser.

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PHOTOGRAPHIC NOTES.

Practical Hints and Developer Formulas.—The suggestions contained in one of G. Cramer's latest circulars are of such a practical nature that we herewith make extracts for the benefit of our readers:

Precautions.

Great care is necessary in the manipulation of very sensitive plates, to guard them against injury by traces of diffused light entering lens, camera, tablet or dark room, or by using too strong a light while developing. A good light can be obtained by combining ruby glass with orange color paper (known as Gold Bank Envelope), and its safety can be tested as follows: Cover one-half of a plate with opaque paper and hold it close to the light for about one minute. Develop, and if the unprotected part shows fog, screen the light with additional paper or fabric until it is perfectly safe. A screen should be provided which will exclude all light from the plate during development. Never expose the plate either in the developing solution or otherwise to the dark room light longer than is necessary to examine its progress from time to time. The lens should be examined by pointing the camera toward strong light and observing if any reflections of light can be noticed, caused by the shining edges of the diaphragm or the inner walls of the tube, which would naturally cause fog. Rings cut out of black paper, placed near the lenses, will stop the reflection. The diaphragms should be blackened.

To test the camera and tablet, wrap a narrow strip of black paper around a plate in such a manner that only a part is protected, put the plate in the tablet and this in the camera. After placing the camera in strong light, pull the slide while the lens is kept covered, and leave it so for about five minutes. If camera and tablet are not light-tight, it will show on developing the plate. Fog is often caused by light entering the slide or between tablet and back of camera.

Pyrogallic acid has been mostly in use and eikonogen has lately come to the front and gained much favor. From our own experience we can highly recommend eikonogen, prepared as follows:

No. 1.

Engl. Measures Troy Weight.		Metric Weights and Measures.
40 ounces	Distilled water	1000 c. cm.
2 "	Sulphite of sodium crystals	50 c. cm.
1 ounce	Eikonogen, finely powdered	25 grammes.

Keep the solution in a well stoppered bottle.

No. 2.

10 ounces	Water	300 c. cm.
1 ounce	Carbonate of potassium	30 grammes.

No. 3.

10 ounces	Water	300 c. cm.
1 ounce	Bromide of potassium	30 grammes.

For Use.

3 ounces	Solution No. 1	120 c. cm.
1 ounce	Solution No. 2	40 c. cm.
6 to 12 minims (or drops)	Solution No. 3	½ to 1 c. cm.

When the developer is quite new, it will be found necessary to add a little bromide solution (No. 3) in order to make it work perfectly clear. The addition of old developer will answer the same purpose. The developer can be used repeatedly by occasionally adding more of Solutions Nos. 1 and 2, omitting the bromide. It produces plenty of intensity by simply leaving the plate in it long enough. Any degree of softness can be obtained by diluting with more or less water, which is also recommended during hot weather and for underexposures.

For overexposed plates restrain by adding more Solution No. 3.

The sulphite of sodium "crystals" are preferred to the "dried or granulated" by reason of their greater purity, but as the crystals will melt during hot weather in their water of crystallization, the dried sulphite of sodium may be found more convenient in hot climates.

Two parts of the crystals are equal to one part of the dried or granular sulphite.

The sulphite of sodium is added to prevent rapid decomposition of the eikonogen. Too much sulphite in the developer renders its action slower.

Fixing Bath.

After developing and rinsing, the negatives may be fixed in a plain hypo bath, one part hyposulphite of soda to four parts of water, but the following formula is especially recommended:

1 quart	Water	1 liter.
4 ounces	Sulphite of sodium crystals	120 grammes.
	After being dissolved add	
½ ounce	Sulphuric acid	15 c. cm.
3 ounces	Chrome alum, powdered	90 grammes.
	Dissolve and pour this into a solution of	
2 pounds	Hyposulphite of soda	1 kilo.
3 quarts	Water	3 liters.

This bath combines the following advantages: It remains clear after frequent use; it does not discolor the negatives and forms no precipitate upon them. It also hardens the gelatine to such a degree that the negatives can be washed in warm water, provided they have been left in the bath a sufficient time. The plate should be allowed to remain in the bath five to ten minutes after the bromide of silver appears to have been dissolved. The permanency of the negative and freedom from stain, as well as the hardening of the film, depends upon this.

Wooden boxes, with grooves to hold a number of plates, will be found both convenient and economical for fixing.

When the bath becomes weakened by constant use, it should be replaced by a fresh solution.

We think three ounces of bisulphite of sodium may be substituted to advantage in place of the sulphite sodium and sulphuric acid.

Intensifying Negatives.—Mr. Cramer also advises the single solution intensifier, should the negative be too weak. First wash the negative well to eliminate all traces of hypo.

Prepare a saturated solution of bichloride of mercury in water, and pour of this a sufficient quantity gradually into a solution of

1¼ ounce	Iodide of potassium	50 grammes.
6 ounces	Water	250 c. cm.

until the point is reached when the forming red precipitate will no longer dissolve by shaking, but be careful not to add more mercury than just enough to make the solution *very slightly* turbid. Now add

1 ounce of hyposulphite of soda	40 grammes.
Dissolve and fill up with water to make total 20 ounces solution	800 c. cm.

For use this should be diluted with about three parts of water. If the plate has not been thoroughly fixed, the intensifying solution will produce yellow stains. Be careful not to overdo the intensifying. Should it have gone too far, the negative can be reduced by placing it in the fixing bath for a short time.

Another method is to first place the plate in a solution of bichloride of mercury, ten grains to the ounce, until the film is whitened, then wash and immerse in a bath of sodium sulphite and water, 40 grains to the ounce, until the film is well blackened.

To reduce over-dense negatives: Dissolve one part red prussiate of potash in 15 parts of water. Wrap the bottle in yellow wrapping paper, as the solution is affected by light and will not keep long. Immerse the negative in a hypo solution, 1 part hypo to 15 parts of water, to which has been added a little of the above, immediately before use. When reduced enough, wash thoroughly.

Yellow colored negatives are caused by insufficient sulphite of sodium in developer, or if the article used is decomposed.

Yellow stains are caused by using plain hypo bath which has assumed a dark color, or by not leaving the plate in the hypo bath long enough.

Developer for Lantern Slides.

No. 1.

Distilled water	80 ounces.
Sodium sulphite (crystals)	3 "
Eikonogen	1 ounce.
Hydroquinone	1 "

No. 2.

Distilled water	80 ounces.
Sodium sulphite (crystals)	3 "
Sodium carbonate	6 "
Lithium carbonate	1 ounce.

Take equal parts of Nos. 1 and 2 for the developer.

The following Eder hypo bath is advised on account of its clearing qualities:

Water	1 gallon.
Hyposulphite of soda	3 lb.
Tartaric acid	1 ounce.
Sodium sulphite (granular)	1 "

The bath keeps white and clear for two weeks.

The combination of hydroquinone with the eikonogen gives a peculiar warm tone to the slide which is not obtainable easily with each alone.

Progress in Electric Welding.

In process of construction at the gun factory in Watervliet is a 10-inch gun which, when completed, will be one of the greatest caliber and most wonderful in its design ever made in this country. The huge gun will be built according to Captain Crozier's latest design of wire winding. Captain Crozier is located in the ordnance department at Washington, and the present gun is the fourth of its kind in existence. The work of boring the gun has been completed, and now it will be placed in the lathe preparatory to commencing the wire winding. The square wire to be used will be of steel, as is also the gun proper, a tenth of an inch in thickness, and will be wound from the breech to the muzzle, the entire length. To produce the desired work a dynamo has been placed in the gun factory which will be utilized to weld the ends of the wire by electricity.

The great demand for artificial ice machines, and the necessity for furnishing long coils of pipe to be used in their construction, has furnished a new and extensive field for the pipe welding machines of the Thomson Electric Welding Company. The difficulty of welding pipe by the old methods is that, unless the joints are perfect, there is an escape of ammonia vapor which renders them practically useless. It is found that by the electric welding process these joints are perfect, and lengths of 400 or 500 feet of homogeneous pipe can be made without difficulty. The electric welds stand bending either hot or cold, and by this process it also becomes practicable to frequently test the coils as they are being bent, and so correct any defects as the process of pipe bending goes on. It is also found that, by the electric welding machines, the pipe can be brought to any degree of heat that is necessary, and special bends made without the introduction of U joints or couplings, as heretofore has been the practice. Long lengths of pipe, with joints which can be relied upon, can thus be laid in the streets of the various cities for conveying cold from the refrigeration apparatus to consumers. Great demands are being made upon the company from various quarters for apparatus for these purposes. The works of the welding company, at Lynn, are crowded to the utmost to supply machines on orders received.

Roebling's Sons & Co., of Trenton, N. J., have made contracts with the welding company for seven additional machines, to be run from a central dynamo for welding copper wire. This is in addition to the plant which they already had in constant operation day and night since December, 1888. Contracts have been made with the United States government for a complete welding plant for boiler tubes, bars, rods, etc., for the New York navy yard, and also a similar plant to be applied to ship construction at the Norfolk yard. Several plants are in successful operation in carriage and wagon works in the West, and other plants for the purpose will soon be installed. There are many new developments of the electric welding process which will soon be made public. The welding machine for shell, shrapnel and other projectiles is now completed, and arrangements will soon be made by the company for producing these in large quantities.—*Electrical Engineer.*

Domestic Uses for Ammonia.

A little ammonia in tepid water will soften and cleanse the skin.

Spirits of ammonia will often relieve a severe headache.

Door plates should be cleansed by rubbing with a cloth wet in ammonia and water.

If the color has been taken out of silks by fruit stains, ammonia will usually restore the color.

To brighten carpets, wipe them with warm water in which has been poured a few drops of ammonia.

One or two tablespoonfuls of ammonia added to a pail of water will clean windows better than soap.

A few drops in a cupful of warm water, applied carefully, will remove spots from paintings and chromoes.

Grease spots may be taken out with weak ammonia in water; lay soft white paper over, and iron with a hot iron.

When acid of any kind gets on clothing, spirits of ammonia will kill it. Apply chloroform to restore the color.

Keep nickel, silver ornaments, and mounts bright by rubbing with woolen cloth saturated in spirits of ammonia.

Old brass may be cleaned to look like new by pouring strong ammonia on it, and scrubbing with a scrub brush; rinse in clear water.

A tablespoonful of ammonia in a gallon of warm water will often restore colors in carpets; it will also remove whitewash from them.

Yellow stains left by sewing machine oil, on white, may be removed by rubbing the spot with a cloth wet with ammonia, before washing with soap.

Equal parts of ammonia and turpentine will take paint out of clothing, even if it be hard and dry. Saturate the spot as often as necessary, and wash out in soap suds.

Put a teaspoonful of ammonia in a quart of water, wash your brushes and combs in this, and all grease and dirt will disappear. Rinse, shake, and dry in the sun or by the fire.

If those who prespire freely would use a little ammonia in the water they bathe in every day, it would keep their flesh clean and sweet, doing away with any disagreeable odor.

Flannels and blankets may be soaked in a pail of water containing one tablespoonful of ammonia and a little suds. Rub as little as possible, and they will be white and clean and will not shrink.

One teaspoonful of ammonia to a teacupful of water will clean gold or silver jewelry; a few drops of clear aqua ammonia rubbed on the under side of diamonds will clean them immediately, making them very brilliant.

THE rapid increase of the wealth, business and prosperity of the United States during the past ten years, says the Boston *Manufacturers' Gazette*, is simply marvelous. According to the published figures, the total wealth of the country is now $71,459,000,000, equal to nearly $1,000 per capita. This is an increase in ten years of $18,000,000,000, or 42 per cent. England's wealth in 1885 is given at $50,000,000,000. The average of wealth per head in England is $1,545, in Scotland $1,215, in Ireland but $565. The total wealth of France is estimated at $36,000,000,000. England exacts in taxes $20 per head of population, while each individual in the United States pays but $12.50. America will produce 7,000,000 tons of iron this year, while England's greatest production is 8,600,000 tons.

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The Locust Tree.

There is not in Europe a more interesting tree for Americans to visit than the venerable locust in the garden of the Museum of Paris. The first of its race to grow in the soil of Europe, it has survived for more than two centuries and a half the wars of the elements and the social cyclones which have swept over it. The seed from which it sprung was planted in 1635 by Vespacian Robin, gardener of Louis XII., in the Jardin du Roi, now called the Jardin des Plantes. Vespacian Robin was the son of a gardener more famous than himself, Jean Robin, who had charge of the Royal Gardens under Henry of Navarre; and it was for the elder Robin that Linnæus, more than a century after his death, named the genus Robinia to which our locust tree belongs. Little is left of the old tree but the shell of the trunk and a few feeble branches which clothe themselves year after year with leaves and flowers, testifying to the wonderful vitality of the locust tree and to the care which has been bestowed upon this specimen by the authorities of the garden, the most interesting in the world, perhaps, in its historical associations with men famous in the annals of botany.

The locust tree (*Robinia Pseudacacia*) has excited, from a cultural point of view, more interest than any other inhabitant of the American forests. There is no other North American tree about which whole volumes have been written, and no other of our trees has been so enthusiastically praised or so widely scattered by cultivation.

The earliest account of the locust tree was published in 1640 by Parkinson, in his classical "Theatrum Botanicum," it having been cultivated in England about that time by the Dutchman John Tradescant, a great traveler and botanist, who held the position of gardener to Charles I. Evelyn, in his "Sylva," published in 1664, records the fact that the Virginia acacia thrives in the king's new plantation in St. James Park; while his great French contemporary, Duhamel, gave a few years earlier specific directions for its cultivation. A hundred years later the locust had so grown in esteem in Europe that something was said about it by nearly every writer who discussed rural economy or the possibility of increasing national wealth through the cultivation of exotic trees. The first book devoted entirely to the locust was published in Paris in 1803. It is a small octavo of 314 pages, and is entitled "Lettre sur le Robinier connu sur le nom impropre de faux Acacia." It was written by M. N. Francois de Neufchateau, a senator and member of the Institute. This work contains the essence of all that had been previously published about the tree in France, and a great deal of information relative to its culture and uses. A translation of portions of Monsieur Francois' essay is published in an English book on the locust, which appeared from the pen of W. Withers, of Holt, in Norfolk, in 1842, under the title of "The Acacia Tree: Its Growth, Qualities, and Uses." William Cobbett, however, better known perhaps as the vituperative political essayist, Peter Pindar, than as an enthusiastic and successful planter of trees, did more by his writing and example than any other man to make known the value and spread the cultivation of the locust tree.

Cobbett, during a forced residence in the United States from 1817 to 1819, occupied himself in farming on Long Island, where he established a small nursery for the propagation of fruit and timber trees. It was at this time that he came to the conclusion that "nothing in the timber line could be so great a benefit as the general cultivation of the locust." On his return to England he carried a small package of the seeds of this tree home with him and began the systematic raising and selling of locust trees, his total sales amounting to more than a million plants. This he tells us in his book called "The Woodlands," which in some respects is the best book on tree planting which has been written in the English language. The author in his preface gives his reasons for having written it: "Many years ago," he says, "I wished to know whether I could raise birch trees from the seed. I looked into two French books and into two English ones without being able to learn a word about the matter. I then looked into the great book of knowledge, the 'Encyclopædia Britannica'; there I found in the general dictionary, 'Birch tree, see Betula, Botany Index.' I hastened to Betula with great eagerness; and there I found, 'Betula, see Birch tree.' That was all; and this was pretty encouragement to one who wanted to get, from books, knowledge about the propagating and rearing of trees." There are tree planters of the present generation who turn to the literature on the subject with results which are hardly more satisfactory. Cobbett's book has long been out of print, but no other work gives such clear and specific direction for rearing and planting trees, and there are portions of it which might well be reprinted for general circulation.

Cobbett's enthusiasm for the locust tree, and his zeal in propagating it, caused it to be planted generally in England in his time, and the fashion, as is often the case with English fashions, crossed the Atlantic, and fifty or sixty years ago no tree was so often planted in this country. Remnants of these old plantations may be seen up and down the Hudson River and in the neighborhood of all our seaboard cities; and the locust is now fairly naturalized in a large part of the country east of the great plains, although originally its range was a comparatively restricted one, it being found only in the forests of the Alleghany Mountains, from Pennsylvania to northern Georgia, and, doubtfully, in a few isolated stations west of the Mississippi River. So far as the United States is concerned, however, the locust tree has not fulfilled the hopes of the early planters. It is preyed upon in this country by a horde of insects who bore into the trunk and destroy the trees or the value of their timber, and the prophecy of the younger Michaux, that the locust tree would become more common in Europe than in its native country, has probably been fulfilled.

It is, however, one of the few American trees, if not the only one, which has become really naturalized in Europe, and there is no other exotic tree which travelers in central Europe see more frequently. This is due, in part, to the fact that it has been planted everywhere along the lines of railroads to hold the soil on the embankments, and because it is the favorite tree for the embellishment of the grounds surrounding the stations.

Long cultivation of this tree has given birth to many varieties, and of these the one known as the Parasol Acacia, with a dwarf, compact, spherical head, usually grafted as a tall standard, is one of the most popular ornamental trees in Europe, where it lines countless miles of roadside and adorns innumerable villa gardens.

The great value of the locust tree is found in the wood which it produces. This is heavy, exceedingly hard and strong, very close grained, and capable of withstanding for a long time the effects of decay, when placed in contact with the ground. This makes it one of the best woods known for fence posts; it has many uses in ship building, and is preferred to the wood of all other trees for treenails, for which purpose it is largely used. It grows rapidly from seed, which is produced in the greatest profusion, and it will adapt itself to almost every kind of soil. The rapidity of its growth is great, and thanks to the lightness of the shade cast by its compound leaves, it does less injury than most other trees to crops growing beneath its branches. The locust is a good hedge plant, too, and the fragrant white flowers are very beautiful. These are the qualities which have made the locust popular, and were it not that it is so liable to the attacks of insects, the planters of the present day would be able to indorse all that Cobbett claimed for it.—*Garden and Forest.*

Colors.

The great chemist Michel Eugene Chevreul, who recently died at the ripe old age of 103 years, terms his research in the realm of colors as the philosophy of natural phenomena. About all the knowledge we possess in this vast and beautiful field is due to this grand old man.

Chevreul's genius has demonstrated that the harmonies of color are submitted to immutable laws which he has revealed, and the certainty and fruitfulness of which he has demonstrated by calculation.

There are but three primary colors generally recognized—blue, red, and yellow. These are called primary because they cannot be produced by compounding any other colors. Then we have the secondaries—green, purple, and orange. These are called secondaries because blue and yellow make green; red and blue, purple; red and yellow, orange. From these we derive the tertiaries—olive, citrine, and russet. Purple and green make olive; orange and green, citrine; purple and orange, russet. Thus we have the three classifications denoting all the colors proper extant. From these are derived the hues, tints, and shades. A hue is obtained by the combination of any of the primaries. The hue may vary according to the predominating influence of one color over another. To obtain a "tint" we simply add white to any of these colors; and to form a "shade" we add black or any of the dark colors.

So from the above we have the alphabet of colors. The variety of tones, tints, hues, or shades to be obtained from this alphabet are as kaleidoscopic in their possibilities as the alphabet of letters. The hand of man or the skill of the artist will never exhaust them.

We have still another term we use in relation to colors which bears its own significance also, and that is "tone." While we have our three primaries to start from, yet we have no standard "tone" from which we shall start our secondaries. There are many different kinds of red, yellow, and blue, and we signify the difference as "tones," the same as we apply the term to different instruments of the same kind. You will say that this piano has a much better tone than that piano. So we will find in selecting our primaries. While some of the "high-toned" reds will produce a much more beautiful tint, yet they are too fugitive to use for exterior house painting; so, too, with the greens and yellows, while some are quite permanent. Below we give a list of formulas for mixing colors which will be of service to the amateur house painter and to ladies who decorate their own "bric-a-brac."

French Red.—This color is simply Indian red, lightened with vermilion and glazed with carmine.

Chocolate Color.—Add lake or carmine to burnt umber; or take Indian red and black to form a brown; then add yellow to bring about the desired shade.

Yellow Lake.—Take of umber and white equal parts and Naples yellow and scarlet lake; glaze with yellow lake.

Olive Brown.—Mix one part of lemon yellow with three parts burnt umber. Change proportions for different shades.

Clay Drab.—Raw sienna, raw umber, and white lead, equal parts; then shade with chrome green.

Bismarck Brown.—Take carmine, crimson lake, and gold bronze, and mix together. If a light shade is desired, use vermilion in place of carmine.

Jonquil Yellow.—Mix flake white and chrome yellow, and add vermilion to carmine.

Medium Gray.—Eight parts of white to two of black.

Lead Color.—Eight parts of white, one of blue, and one of black.

Light Buff.—Yellow ocher, tinted with white.

Deep Buff.—The same, wth the addition of a little red.

French Gray.—White shaded with ivory black.

Gold Color.—White and yellow, shaded with red and blue.

Pearl Color.—White, black, and red in proportions to suit taste.

Canary Color.—Five parts white and three parts lemon yellow.

Oak Color.—Five parts white, two of yellow, and one of red.

Olive Color.—Eight parts of yellow, one blue, and one black.

Snuff Color.—Four parts of yellow and two of Vandyke brown.

Rose Color.—Five parts of white and two of carmine.

Bottle Green.—Dutch pink and Prussian blue for ground; glaze with yellow lake.

Salmon Color.—Five parts white, one yellow, one umber, one red.

Brown.—Three parts of red, two black, and one yellow.

Copper Color.—One part red, two of yellow, and one of black.

Lemon Color.—Five parts of lemon yellow and two of white.

Straw Color.—Five parts of yellow, two of white, and one of red.

Fawn Color.—Eight parts of white, one of red, two yellow, and one of umber.

Flesh Color.—Eight parts of white, three of red, and three of chrome yellow.

Chestnut Color.—Two parts of red, one of black, and two of chrome yellow.

Wine Color.—Two parts of ultramarine and three of carmine.

Green.—Blue and yellow or black and yellow.

Maroon Color.—Three parts of carmine and two of yellow.

Tan Color.—Five parts of burnt sienna, two yellow, and one raw umber.

Pea Green.—Five parts of white and one of chrome green.

Stone Color.—Five parts of white, two of yellow, and one of burnt umber.

Citron.—Three parts of red, two of yellow, and one blue.

Drab Color.—Nine parts of white and one of umber.

Lilac.—Four parts red, three white, and one blue.

Purple.—The same as lilac, but differently proportioned; say two parts of blue.

Violet.—Similar, but more red in than purple.

Cream Color.—Five parts white, two yellow, and one red.

Claret.—Red and black, or carmine and blue.

Dove Color.—Red, white, blue, and yellow.

Light Gray.—Nine parts white, one blue, and one black.

Willow Green.—Five parts white, two verdigris.

Peach Blossom.—Eight parts white, one red, one blue, and one yellow.

Bronze Green.—Five parts chrome green, one black, and one umber.

Carnation Red.—Three parts lake and one white.

Grass Green.—Three parts yellow and one Prussian blue.

Brick Color.—Two parts yellow ocher, one red, and one white.

Portland Stone.—Three parts raw umber, three yellow ocher, one white.

Plum Color.—Two parts white, one blue, and one red.—*S. Paris Davis, N. W. Builder and Decorator.*

THE baryta deposits on McKellar's Island, Canada, are now being worked. Experts pronounce this to be the finest deposit in America.

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RECENTLY PATENTED INVENTIONS.

Mechanical.

HYDRAULIC FORGING PRESS.—Charles Davy, Sheffield, England. This invention relates to the feed rollers of a press for operating on large plate blooms and similar work, requiring to be reduced in thickness by successive squeezings of consecutive portions of their length, and vertically movable feed rollers are upheld by counterbalance weights or other yielding power, in connection with mechanism whereby the press head is caused to depress the feed rollers concurrently with the compression of the ingot.

FLOOR JACK. — James E. Bean, Ironwood, Mich. The head block of this jack has a grooved bearing face, and on the block is pivotally mounted a spirally inclined cam having a lever arm, while loosely connected to the block is a retaining block or plate having retaining claws, and arranged to be borne upon by the cam, the jack taking up but small space, and being designed to force all the flooring boards to place except the last one.

HUB CLAMP AND WRENCH. — John Sullivan, Grand Rapids, Mich. This is a combination tool for the simultaneous removal of a spindle nut and the wheel of a vehicle, and is a simple and compact implement by the use of which the hub may be firmly grasped and the wheel, along with the spindle nut, be expeditiously and readily removed.

PAN MAKING MACHINE. — Charles A. Codding and Lloyd E. Wilbur, Dowagiac, Mich. This is a machine specially designed to form ash pans from the sheet metal blanks, and the invention covers various novel details and combinations of parts whereby the pans can be quickly shaped ready to be riveted, while the machine requires but little power to operate it.

Miscellaneous.

LANTERN.—Carl Rabenstein and John Reineking, Neillsville, Wis. This invention provides means whereby lanterns may be expeditiously and effectively clamped upon the thills or tongue of a vehicle and as readily detached therefrom, the invention covering a novel construction and combination of parts.

GLOVE DONNING IMPLEMENT.—Isaiah D. Crispell, West Stockbridge, Mass. This is a device with a handle having an arm extending from one end in a straight direction and diverging arms extending from the handle at each side of the straight arm, making a neat and efficient implement to facilitate the putting on of tight gloves.

AIR SHIP.—Carl G. E. Hennig, Paterson, N. J. This is an air ship in which the car, instead of being rigidly attached to the balloon, is freely suspended therefrom by ropes or like connections, the invention covering a novel construction, arrangement, and combination of parts to maintain the suspended car in its proper position relatively to the balloon.

MILK COOLER. — William W. Conder, Hebo, Oregon. This invention provides a series of small deep receptacles which are in free communication at their lower ends, the whole being placed within an outer tank or receptacle, whereby the cream will rise with great rapidity and the whole will remain sweet for a long time.

RUNNING GEAR FOR VEHICLES. — Evert Takken, Douglas, Mich. This invention relates especially to the construction of the forward axle of buggies and attachments thereto, providing a simple device for attachment to the spring and vehicle body, whereby the axle may be readily turned beneath the body and with but little friction.

TABLET FOR PURSE FRAMES. — Louis B. Prahar, Brooklyn, N. Y. This is an attachment for the frames of purses, chatelaine bags, and similar articles, whereby one or more leaves or tablets may be made to constitute virtually a portion of the frame, and which will be convenient of access and may be concealed when not in use.

FRUIT CAN.—Reuben C. Munger, Chebanese, Ill. This is a can or jar with the mouth of the same diameter as the body, and in which the cover may be perfectly sealed and firmly held in place, there being combined therewith a pivoted lever having a beveled end engaged by a link, a screw engaging the link and drawing it forward upon the beveled end.

CARRIAGE CURTAINS.—John M. Mast, Cambridge, Pa. This invention provides a button hole shield and latch for curtains, re-enforcing the button hole and making an efficient device which will not rot or otherwise damage the curtains by retaining moisture.

RACK FOR EXHIBITING CLOAKS, ETC. —John H. Eyles, New York City. This rack has opposite and rigid foot pieces having holding plates secured thereto, and each provided with two rigidly held uprights, in combination with a continuous cross piece having locking lugs, and other novel features, the rack being very strong and durable and adapted to be readily taken apart for shipment and easily set up for use.

MOULD FOR CASTING SAD IRONS. — Jacob M. Davies, New Castle, Pa. This is a separable metal mould for casting sad irons in pairs, to dispense with the use of sand moulding, whereby the work is designed to be speedily performed by unskilled labor at a great reduction of expense.

WASH BOILER. — Henry J. F. Rose, High Bluff, Manitoba, Canada. This is an improved washing and steaming machine with an outside boiler or tank having a corrugated bottom, and a smaller inner casing surrounded by a waterspace, there being a novel arrangement of tubes to promote the rapid circulation of hot, soapy water, whereby the clothes will be quickly and thoroughly washed.

GAS MANUFACTURE. — John A. McCollum and Benjamin F. Burt, Riverside, Cal. This invention relates to an apparatus for the manufacture of water gas from superheated steam and oil, the furnace having a lower coal compartment and an upper lime compartment, oil pipes discharging into the coal compartment, and a steam pipe and air blast entering below the grate, while the outlet pipe leads to a fixing chamber.

SPECULUM. — Richard P. and Charles H. McCully, Brooklyn, N. Y. This is an instrument so made as to be capable of quick dismemberment for cleaning purposes, the parts being likewise adapted to be readily put together for use.

INSECTICIDE.—James M. A. Miller and Peter McMaster, San Mateo, Fla. This is a compound of sulphur, caustic soda, chloride of sodium, nitrate of potassa and water, the invention including the process by which the sulphur is reduced from a solid to a fluid condition.

TOY PISTOL. — Edward Dennis, Jr., and George E. Williams, Sing Sing, N. Y. This is a device so constructed as to form practically a revolver, providing means whereby a number of paper caps may be loaded at one time in order for successive firing, thereby avoiding the delay of loading a single cap at each firing.

ORTHOPEDIC MARCHING MACHINE. — Joseph L. Naish, New York City. This is a stationary machine in which a person is placed with shoulders held back firmly to a back board, while the feet are fastened upon small cars which move in tracks limited to the extent of the prescribed pace, motion thereto being given by the feet as in ordinary walking, the hips being held in a guide, and the invention covering various other novel features, in order to facilitate the teaching of correct marching to soldiers and others.

FOLDING T-SQUARE. — Henry W. Oliver, New York City. This invention consists of a head comprising two arms pivoted to the blade and adapted to be folded thereon or extended in line with each other and at angles to the blade, the implement being adapted to be conveniently folded up for transportation and easily extended and unfolded for use.

SUGAR CANE CUTTER AND CRUSHER. —Jose R. Mesa, Yuga Santa Catalina, Cuba. This is a combined machine comprising a hopper communicating with a cylinder having radial perforations and having a grinding shell at its lower end, in which is supported a rotary centrally apertured knife-carrying tube or sleeve, a grinding cone being secured on the shaft within the shell, and the invention covering various other novel features and combinations of parts.

STENOGRAPHER'S STAND.—George C. Logan, New Orleans, La. This is a stand with rollers arranged beneath to receive the ends of a web, a spring arranged in connection with one of the rollers, and a tripping attachment, to facilitate the turning over or removal of sheets on which the stenographer's notes have been taken.

SCOURING AND WASHING APPARATUS. Frank E. Anderson, East Orange, N. J. This is an apparatus more particularly intended for the cleansing and washing of wool, in which a succession of fiber-submerging tubes are employed, with pressure or squeeze rolls interposed between the tubes and at the terminus of the series, whereby the wool or fiber is more effectually cleaned.

ORNAMENTING HOLLOW WARE. — Frederick H. Webster, Brooklyn, N. Y. This invention relates to ornamenting in relief or intaglio, or both, of metal hollow ware, by mechanical means, by a process of expanding the body of the hollow blank into an embossing die by means of a block of soft India rubber to which pressure is applied, and designed to make a finish equal to repousse work, and hand chasing and engraving.

EXHIBITION TRAY. — Henry K. Dyer, Brooklyn, N. Y. This tray has a narrow border covered with plush or other fabric, combined with a removable center piece held within and by the border, a cover for the center piece being held between its outer edge and the edge of the border, the tray being designed more particularly for jewelers' use, and the covering for the central portion being readily changed.

FENCE POST. — Ebenezer Butterick, Brooklyn, N. Y. This is a light post designed to be secured in place without excavating, having a vertical strip attached to a wooden section, with a socket in its lower end to which is secured a rod with an inverted box-shaped anchor, having tapering sides and sharp edges, and an oval top with an aperture, the anchor abutting against the lower edge of the post, with the rod projecting through it.

NEW BOOKS AND PUBLICATIONS.

A NEW MEDICAL DICTIONARY. Including all the words and phrases used in medicine, with their proper pronunciation and definitions. By George M. Gould. Philadelphia: P. Blakiston, Son & Co. 1890. Pp. 519. Price $3.25.

An alphabetical list, with definitions of medical terms, makes up the body of this work. To this are added lists of abbreviations used in the different branches of medicine and appendices containing tables, with analyses of the waters of the mineral springs of the United States, duration of life, death rates of the different countries and States, and a large amount of other very valuable material. Its compact form and reasonable price render the book more than desirable.

PAVEMENTS AND ROADS: THEIR CONSTRUCTION AND MAINTENANCE. Compiled by E. G. Love. 1890. *The Engineering and Building Record.* New York. Pp. 410. Price $5.

The Engineering and Building Record has published recently a number of articles on the maintenance of roads and pavements. The present work includes a compilation of these papers. At the present day a great interest in road making is being developed, and the States are passing road bills for the encouragement of building country roads. The State of New Jersey, under some of these enactments, is doing a most extensive work in laying county thoroughfares on the Telford system, and any contribution to the science of engineering and road making is peculiarly timely. It is satisfactory to notice that other places complain of their pavements besides the cities of the United States, and that we are not alone in having poor streets.

HISTORY OF THE AMERICAN PIANOFORTE, ITS TECHNICAL DEVELOPMENT, AND THE TRADE. By Daniel Spillane. New York: D. Spillane Publisher. 1890. Pp. 369.

It is to be presumed that there is an American pianoforte. Accepting this as the case, its development and present status is well given in Mr. Spillane's new book. The portraits of representative makers of this country add largely to the interest of the work. Numerous illustrations of the mechanisms used are given.

LOCOMOTIVE ENGINE RUNNING AND MANAGEMENT. By Angus Sinclair. New York: John Wiley & Sons. 1890. Pp. xx, 416. Price $2.

The running of a locomotive has a fascination for many who are little interested in other divisions of mechanics. The whole history of the engine runner's work, followed by a treatise on the management of the different parts, including the shifting link, valve setting, link motion, Westinghouse air brakes, etc., with numerous illustrations and a short specimen examination paper, are embodied in the book. It will be found of rather general interest from the careful way in which it is written, and from the picture it draws of the responsibilities annexed to the position of engine driver.

A SHORT COURSE OF EXPERIMENTS IN PHYSICAL MEASUREMENT. By Harold Whiting. In four parts. Part I. Cambridge: John Wilson & Son. 1890. Pp. xii, 278.

Physics has ceased to be merely a science of demonstration, but has developed largely into one of measurements. Such works are designed for students, to make them do work in the laboratory of the same character as that required in advanced physical studies. As far as the ground goes, in this first part, it is very thoroughly covered, and the work is kept strictly on an elementary basis. The necessary calculations are, of course, supplied.

SCIENTIFIC AMERICAN BUILDING EDITION.

JULY NUMBER.—(No. 57.)

TABLE OF CONTENTS.

1. Elegant colored photographic plate of the residence of Henry R. Towne, at Stamford, Conn. H. H. Holly, of New York, architect. Perspective elevation, floor plans, sheet of details, etc. Cost $20,000.
2. Plate in colors of a dwelling at Tremont, N. Y. Floor plans, perspective elevation, sheet of details, etc. Cost $6,000.
3. Perspective elevation and floor plans of a residence at Monclair, N. J. J. C. Cady, of New York, architect. Cost complete $10,000.
4. Photographic view and floor plans of a residence at West Brooklyn, N. Y. Cost $4,500.
5. A cottage at Dunwoodie, N. Y. Floor plans and perspective elevations. Cost $5,000 complete.
6. A dwelling at Holyoke, Mass. Perspective and floor plans. Cost complete $5,500.
7. Sketch of a residence at Surbiton.
8. Design for a one story house to cost about $1,000.
9. Engravings representing the exterior and plan of a large piggery.
10. A dwelling erected for Mr. C. D. Danforth, Yonkers, N. Y. Floor plans and perspective. Cost $9,000 complete.
11. Photographic perspective view and floor plans of a neat and desirable cottage recently erected at Griswold, Iowa, from plans and perspective published in the SCIENTIFIC AMERICAN. Cost $1,075.
12. A handsome residence at Springfield, Mass., erected for Mr. E. W. Shattuck. Perspective and floor plans. Cost $15,000.
13. Floor plans and photographic perspective of several cottages erected for the late Hon. Chas. Crary, at Chester Hill, Mount Vernon, N. Y. Cost $4,000 each complete. Mr. J. C. Brown, of Mount Vernon, architect.
14. Sketch of a chapel and village hall. Estimated cost $20,000.
15. Page engraving of the Ripon Cathedral, Yorkshire, England.
16. Miscellaneous contents: Steam and hot water heating.—The garden.—European health resorts. —Fireproof paint.—Testing well water for sewage. —The carpenter.—Fire clay in Montana.—The Spence hot water heater, illustrated.—Improved sliding blinds, illustrated. — Prepared building paper. — An improved separator and trap for steam boilers, illustrated. — Lyle's storm and screen door, illustrated.—A sheet copper statue thirty-five feet high, illustrated.—A boiler for greenhouses, dwellings, etc., illustrated.—An efficient ventilating fan, illustrated.—An improved door hanger, illustrated. — Taste in selecting paint.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

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For Sale—New and second hand iron-working machinery. Prompt delivery. W. P. Davis, Rochester, N.Y.

Acme engine, 1 to 5 H. P. See adv. next issue.

Tuerk water motors at 12 Cortlandt St., New York.

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Friction Clutch Pulleys. The D. Frisbie Co., N.Y. city.

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Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

C. E. Billings' Patent Surface Gauge. Drop Forgings. Bronze Forgings. Billings & Spencer Co., Hartford, Conn.

Veneer machines, with latest improvements. Farrel Fdry. and Mach. Co., Ansonia, Conn. Send for circular.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 13.

For Sale—The whole or part of patent for stone polishing machine, illustrated on page 19. For particulars address the inventor.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Manhattan packing is self-lubricating. It keeps the piston rods bright and smooth. Send for sample and price list to Greene, Tweed & Co., 83 Chambers St., N. Y.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Gas and Petroleum Engines. A practical treatise on the Internal Combustion Engine. By W. Robinson. 596 pages. Fully illustrated. $5.50. E. & F. N. Spon, 12 Cortlandt St., New York.

A business man who has visited nearly every town in the United States desires an agency for manufacturers or others having goods or machinery for sale. References. Address W. Y., box 132, Cheshire, Conn.

Practical Electric Bell Fitting. Full description for the fitting up and maintenance of electric bells for all purposes. By F. C. Allsop. 150 illustrations. Large plates. $1.25. E. & F. N. Spon, 12 Cortlandt St., New York.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(2303) E. A. P. asks for receipt for sticky fly paper. A. Mix by heat 3½ ounces raw linseed oil, 1 pound resin, and add 3½ ounces molasses. Apply to paper while warm.

(2304) S. S. asks: If four balls each 2¾ inches in diameter were placed on level surface, ½ inch apart, so as to form a square so that a ball 4 inches in diameter would rest upon all the balls, what would be the elevation of the large ball above the level surface? A. The problem is easily solved by the rule of the square of the hypotenuse. The top of the large ball will be 5·945 inches above the level surface.

(2305) H. B. asks for a cement or paste that is transparent and will stick glass together. I want it for a photo lense which has become uncemented. A. Use Canada balsam.

(2306) W. S. S. asks for a good recipe for renovating carpets, to restore the colors and remove stains. A. First beat the carpets thoroughly. Then, after they are tacked down, wash them with warm solution of 1 part ox gall to 25 parts water by measure. Mix and use a little of the solution at a time, so as to have it always warm and clean.

(2307) F. G. B. writes: I have an Indian knife in my possession which I think is meteoric iron. Is there any way in which it could be proved? A. It would be difficult or impossible to prove it. The presence of nickel would tend to prove that it was made from meteoric iron.

(2308) A. H. T. asks: 1. What is the name and price of American microscopical journal? A. The Microscope, Trenton, N. J. $1 per year. American Monthly Microscopical Journal, Washington, D. C. $1 per year. 2. What chemical reaction, if any, takes place when a strong solution of niter cake is added to chloride of lime? A. If by niter cake you mean crude acid sulphate of soda, then some chlorine would be set free, with interchange of sulphuric and hypochlorous acids of the lime and soda salts respectively.

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(2309) W. G. S. writes: 1. Which is the right side to use tracing cloth with ink—the smooth or the dull side? A. Use the smooth side. 2. What remedy is there to prevent the ink from running? A. The ink should be thick, and the pen should be pressed lightly on the cloth.

(2310) A. T. S. writes: 1. Please inform me what day of the week the 10th of September, 1853, 1854, 1855, 1856, and 1886 fell on? A. 1853 Saturday, 1854 Sunday, 1855 Monday, 1856 Wednesday, 1886 Friday. 2. What preparation do the skin doctors use to eradicate small scars from face and hands? A. Any number of cosmetics are recommended, but none can be given as a universal panacea. 3. Has the starch solution to be boiled for the iodine ink? How long will it take to fade? A. It should be boiled, and allowed to cool before adding the iodine. It is not very satisfactory, and its period of fading cannot be predicted.

(2311) T. E. P. asks what to add to crude gutta percha while dissolved, to make it stick to glass. I have had a great deal of trouble with it. A. To make gutta percha adhere to glass, apply heat after the solvent has completely evaporated. 2. Can I get zinc plates for a battery all ready amalgamated, from any electrical supply house? A. Amalgamated zincs may be had on special order, but they are very brittle and liable to break in transportation. You can amalgamate them without trouble by rubbing with mercury moistened with dilute acid. A piece of galvanized iron makes the best rubber for applying the mercury.

(2312) E. M. writes: Clay is principally discolored by oxide of iron. Would an electromagnet do much to purify same, provided the clay in a liquid state could be repassed very close to the poles of same? A. A magnet will not attract sesquioxide of iron. It might purify clay from pyrites if the latter were of the magnetic variety. In our SUPPLEMENT, Nos. 340 and 383, you will find articles on the subject of treatment of clays.

(2313) T. J. L. asks: Can you inform me what will take a rust stain out of granite? I have tried oxalic acid, but after seven or eight days the stain returns. A. Try the effect of hydrochloric acid after the oxalic acid has been applied.

(2314) W. H. S., Nebraska, says: A few weeks ago you gave an account in the SCIENTIFIC AMERICAN of a well somewhere in the East that at times gave forth a current of air. Our wells here are from two to three hundred feet deep, and at times the air comes so fast that it can be heard rods away, and at other times it sucks down. When the wind is north, the water rises five and six feet. When the wind is south, the water goes down. Our opinion is the rise and fall of the water is what causes the current. What I should like to have explained is, how can the wind affect the water that depth under the ground? We are about one thousand miles from any body of water. A. The earth is porous, and contains air down to the water line. Changes of pressure in the atmosphere, as indicated by the barometer, must naturally be felt through the porous upper stratum and down to the water line. This, however, at the utmust, would only account for a small part of the variation in level which you speak of. The cause of so great a change of level must be considered as indeterminable in many cases. Often a special investigation will reveal it.

(2315) A. H. asks: 1. Can you give me the formula for a crystal cement for cementing glass that will not dim its brilliancy? A. Use Canada balsam or dammar varnish. 2. Is it possible to make everything perfectly horizontal? What I mean, suppose you aim a gun in a horizontal manner, does not that gun barrel describe the part of a circle of the same radius as the earth? A. Practically no, theoretically yes. In practice the departure from the horizontal is quite imperceptible. In the case of the gun barrel it would not describe a circle of the earth's radius, but would simply sag or bend downward an infinitesimal amount. 3. Can you give me the formula for making artificial ivory that will not dissolve in water? A. Mix 8 parts shellac with 32 parts strong ammonia and agitate for some hours in a closed vessel. After solution mix with it 40 parts zinc oxide in a paint mill. Expel ammonia by heating, dry, grind, and press into shape at a temperature of 500° to 540° Fah. We cannot answer the other queries.

(2316) W. J. P. asks (1) why a flash or stroke of lightning in the vicinity of a telegraph line will break the circuit on that line, causing the sounder to work by jerks, notwithstanding the same is held down by a strong battery of four cells. The undersigned, who is a constant reader of your paper, noticed the above phenomenon on a private line, with ground circuit, running from his house to that of a friend's a mile distant. A. When the lightning opposes the action of the batteries, it neutralizes the battery current and releases the armatures. 2. Is there any effectual means by which grass can be prevented from growing up between bricks in the pavement, or which will exterminate it after it has once grown up? A. A solution of common salt in water poured along the joints between the bricks will kill the grass. Chloride of lime is more powerful.

(2317) C. C. P. asks: 1. Can you give me a formula for modeling wax that will be a good substitute for clay? A. Mix thoroughly at as low a heat as possible 2 parts yellow beeswax, 4½ ounces Venice turpentine, 2 ounces lard and 1¾ pounds elutriated bole (a fine ferruginous clay). Pour into a vessel with water and knead several times. 2. What produces the sound when one whistles? A says that the size of the opening at the lips produces the different tones. B says that the pitch is governed by the position of the tongue, as the tongue is low in the mouth when a low tone is made, and is raised correspondingly with the tone. Also a tone of the same pitch can be formed with a large and a small aperture of the lips. Have the vocal chords anything to do with it? A. The air rushing out through the lips produces a sound which is modified in pitch by the size of the cavity of the mouth. This acts as a resonator and re-enforces the particular note to which it corresponds. The vocal chords do not play any part in whistling.

(2318) W. H. Y. asks (1) how to make a dark cherry stain of good quality for staining scroll work, etc. A stain that will soak into the wood and not rub off and will take a good finish. A. You may use a suitable aniline color (diamond dye) after working the wood in a bath of Castile soap 3½ parts in water 100 parts, or use a decoction of logwood in vinegar. 2. Also how to obtain a dark finish on oak and ash? A. Inclose in a box or closet with some saucers or plates of strong ammonia. The fumes will darken the wood.

(2319) C. A. asks: What substance could I use for a fire balloon? I have used a rag, a wick, and some sponge soaked in kerosene, turpentine, or alcohol. They all set my balloons on fire except alcohol, which is too expensive for a large balloon. A. Use paper. Soak the neck in a solution of alum. Surround the sponge with a tube or chimney of thin asbestos paper.

(2320) F. H. J. asks for a formula for gum and mode of applying to paper, as is used for gummed label paper. A. We have repeatedly published the postage stamp composition:

Dextrine	2 parts.
Acetic acid	1 "
Water	5 "
Alcohol	1 "

Or use a solution of gum arabic in water with a little glycerine. The proportion of the latter must be varied according to weather.

(2321) J. V. F. writes: Please give a solution of the following problem: A man buys 20 pencils for 20 cents. The prices are 4 cents apiece, 2 for a cent and 4 for a cent. How many of each did he get? A. It can be done tentatively on basis of following equations:

$$x+y+z=20$$
$$4x+\tfrac{1}{2}y+\tfrac{1}{4}z=20$$

The value of x it is evident must be 1, 2, 3 or 4. On trial it is found that $x=3$ gives an answer, when $y=15$ and $z=2$, or 3 pencils at 4 cents, 15 pencils at ½ cent, and 2 pencils at ¼ cent.

(2322) H. S. asks: Which chemical offers the most resistance to heat? A. Oxide of calcium (quicklime); of common substances, oxide of zirconium is probably as good a non-conductor as is known.

(2323) W. A. W. asks how to dissolve white shellac gum. Have tried alcohol, and while it softens the gum it will not dissolve it, but the same alcohol will dissolve orange shellac all right. A. The trouble is that the white shellac contains water. Use more and stronger alcohol.

(2324) W. J. asks (1) for alloy which will melt in hot tea. A. Tin 25 parts, lead 50, bismuth 12, cadmium 13. 2. Also the formula for Pharaoh's serpents. A. See our SUPPLEMENT, No. 259. 3. The chemicals which are put in paper torpedoes. A. Fulminating powder, such as used in percussion caps.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 24, 1890.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Addresses or labels to wrappers, envelopes, or publications, attaching, J. D. Robertson 430,787
Alarm. See Burglar alarm. Mill elevator alarm.
Alkaline carbonates and acetone, making, F. W. A. Frerichs 430,734
Anchor, C. J. Whealton 430,793
Animal shears, D. F. McDonald 430,663
Annunciator, R. P. Garsed 430,735
Badge, De Young & Andrews 430,730
Bale tie, L. R. Lantz 430,864
Balling machine, sliver, G. J. Torrance 430,900
Band cutter and feeder, W. Holliday 430,954
Band twister, G. H. Howe 430,650
Bar. See Harvester bar.
Barrel elevator, W. H. Pierson 431,006
Barrow wheel, J. P. Haigh 430,942
Basin cover, catch, G. G. Campbell 430,620
Battery. See Diffusion battery. Galvanic battery.
Beam or girder, G. W. Dithridge 430,840
Bed, invalid, D. T. Fox 430,635
Bed lounge, A. Morris 431,002
Belt fastener, S. H. Morrall 430,668
Bending machine, J. S. Stevenson 430,898
Berth, ship's, D. F. McDonald 430,670
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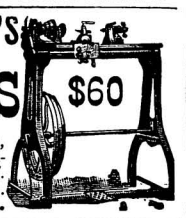

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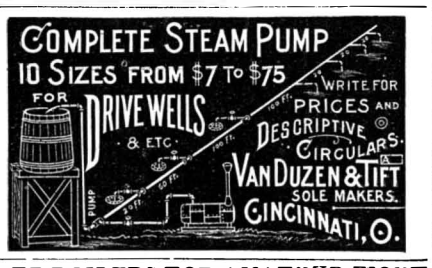

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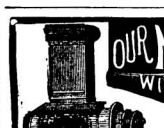

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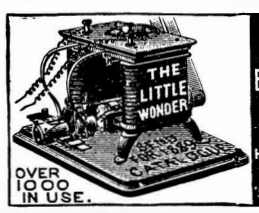

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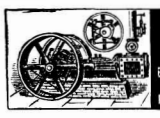

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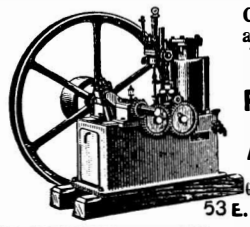

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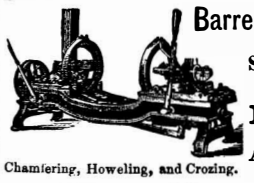

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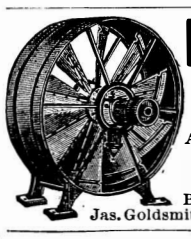

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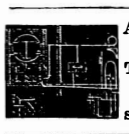

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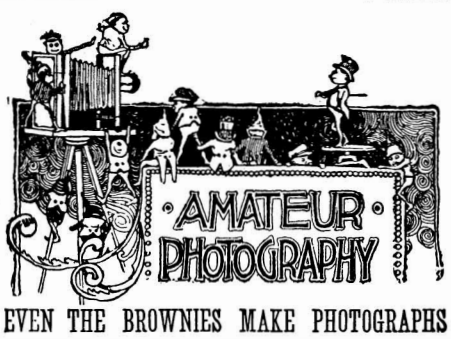

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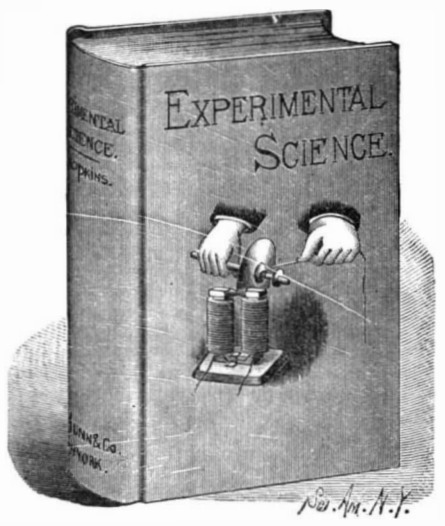

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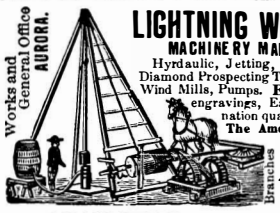

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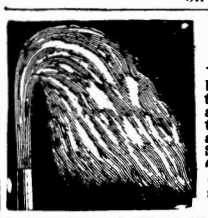

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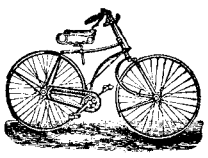

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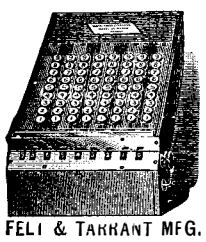

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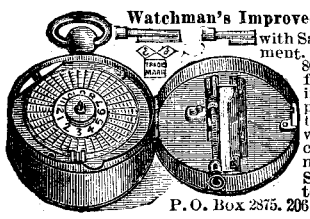

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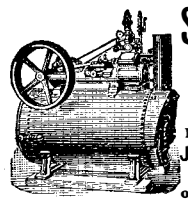

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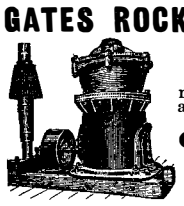

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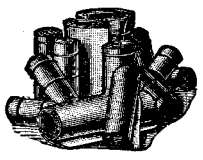

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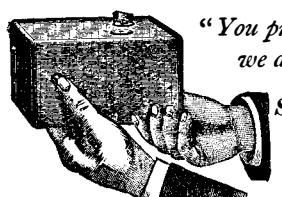

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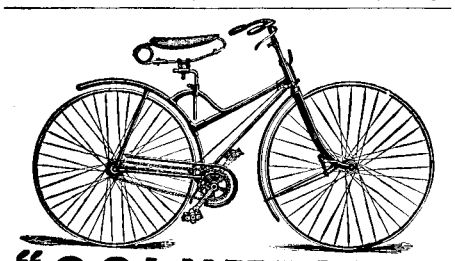

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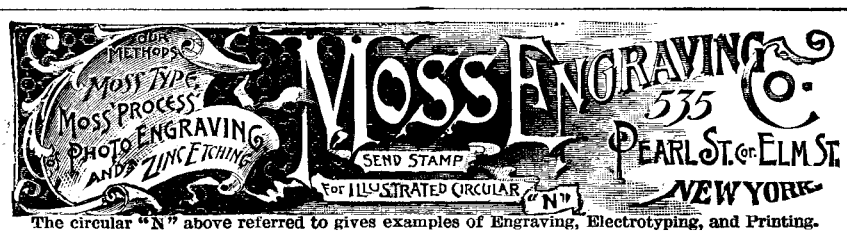

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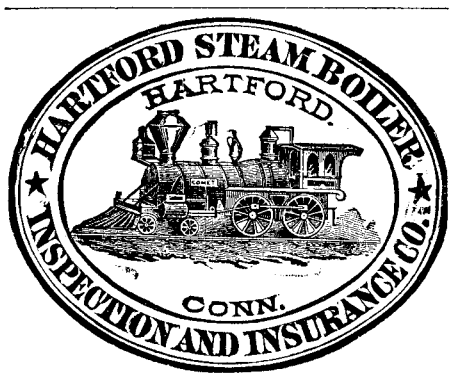

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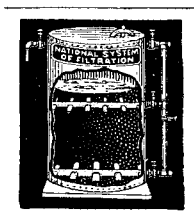

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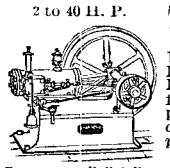

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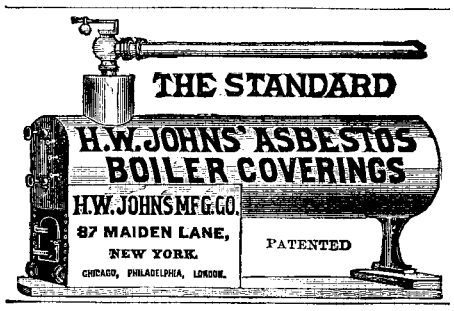

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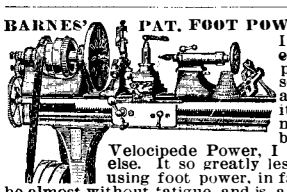

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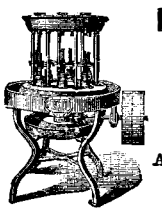

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